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(54) Title: NUCLEIC ACID BASED MODULATORS OF GENE EXPRESSION

(57) Abstract: Novel nucleic acid molecules useful as inhibitors of gene expression, compositions, and methods for their use.

NUCLEIC ACID BASED MODULATORS OF GENE EXPRESSION

Background of the Invention

This invention relates to reagents useful as inhibitors of gene expression relating to diseases such as cancers, diabetes, obesity, Alzheimer's disease, cardiac diseases, age-related diseases, and/or hepatitis B infections and related conditions.

Summary of the Invention

The invention features novel nucleic acid-based techniques [e.g., enzymatic nucleic acid molecules (ribozymes), antisense nucleic acids, 2-5A antisense chimeras, triplex DNA, antisense nucleic acids containing RNA cleaving chemical groups (for example, Cook et al., U.S. Patent 5,359,051)] and methods for their use to modulate the expression of molecular targets impacting the development and progression of cancers, diabetes, obesity, Alzheimer's disease, cardiac diseases, age-related diseases, and/or hepatitis B infections and related conditions

In a preferred embodiment, the invention features novel nucleic acid-based techniques [e.g., enzymatic nucleic acid molecules (ribozymes), antisense nucleic acids, 2-5A antisense chimeras, triplex DNA, antisense nucleic acids containing RNA cleaving chemical groups (for exaple, Cook et al., U.S. Patent 5,359,051)] and methods for their use for inhibiting the expression of disease related genes, e.g., Protein-Tyrosine-Phosphatase-1b (PTP-1B, Genbank accession No. NM_002827), Methionine Aminopeptidase (MetAP-2, Genbank accession No. U29607), beta-Secretase (BACE, Genbank accession No. AF190725), Presenilin-1 (ps-1, Genbank accession No. L76517), Presenilin-2 (ps-2, Genbank accession No. L43964), Human Epidermal Growth Factor Receptor-2 (HER2/c-erb2/neu, Genbank accession No. X03363), Phospholamban (PLN, Genbank accession No. NM_002667), Telomerase (TERT, Genbank accession No. NM_003219) and Hepatitis B virus genes (HBV, Genbank accession No. AF100308.1). Such ribozymes can be used in a method for treatment of diseases caused by the expression of these genes in man and other animals, including other primates.

Thus, in an additional preferred embodiment, the invention features novel nucleic acid-based techniques such as enzymatic nucleic acid molecules and antisense molecules and methods for their use to down regulate or inhibit the expression of genes encoding Protein-Tyrosine-Phosphatase-1b (PTP-1B), Methionine Aminopeptidase (MetAP-2),

beta-Secretase (BACE), Presenilin-1 (ps-1), Presenilin-2 (ps-2), Human Epidermal Growth Factor Receptor-2 (HER2/c-erb2/neu), Phospholamban (PLN), Telomerase (hTERT) PKC alpha. and Hepatitis B (HBV) proteins. In particular, applicant describes the selection and function of nucleic acid molecules capable of cleaving RNAs encoded by these genes and their use to reduce levels of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV proteins in various tissues to treat the diseases discussed herein. Such nucleic acid molecules are also useful for diagnostic uses.

In a preferred embodiment, the invention features the use of one or more of the nucleic acid-based techniques independently or in combination to inhibit the expression of the genes encoding PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV. Specifically, the invention features the use of nucleic acid-based techniques to specifically inhibit the expression of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, PKC alpha, and/or HBV genes.

In yet another preferred embodiment, the invention features the use of an enzymatic nucleic acid molecule, preferably in the hammerhead, NCH (Inozyme), G-cleaver, amberzyme, zinzyme, and/or DNAzyme motif, to inhibit the expression of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, PKC alpha and/or HBV RNA.

Applicant indicates that these nucleic acid molecules are able to inhibit expression of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, PKC alpha, and/or HBV genes. Those of ordinary skill in the art, will find that it is clear from the examples described that other nucleic acid molecules that inhibit target PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV encoding mRNAs may be readily designed and are within the scope of the invention.

By "inhibit" it is meant that the activity of target genes or level of mRNAs or equivalent RNAs encoding target genes is reduced below that observed in the absence of the nucleic acid molecules of the instant invention (*e.g.*, enzymatic nucleic acid molecules), antisense nucleic acids, 2-5A antisense chimeras, triplex DNA, antisense nucleic acids containing RNA cleaving chemical groups). In one embodiment, inhibition with an enzymatic nucleic acid molecule preferably is below that level observed in the presence of an enzymatically attenuated nucleic acid molecule that is able to bind to the same site on the mRNA, but is unable to cleave that RNA. In another embodiment, inhibition with nucleic acid molecules, including enzymatic nucleic acid and antisense

molecules, is preferably greater than that observed in the presence of, for example, an oligonucleotide with scrambled sequence or with mismatches. In another embodiment, inhibition of target genes with the nucleic acid molecule of the instant invention is greater than in the presence of the nucleic acid molecule than in its absence. According to the invention, the activity of telomerase enzyme or the level of RNA encoding one or more portein subunits of the telomerase enzyme is inhibited if it is at least 10% less, 20% less, 50% less, 75% less or even not active or present at all, in the presence of a nucleic acid of the invention relative to the level in the absence of such a nucleic acid.

By "enzymatic nucleic acid molecule" it is meant a nucleic acid molecule which has complementarity in a substrate binding region to a specified gene target, and also has an enzymatic activity which is active to specifically cleave target RNA. That is, the enzymatic nucleic acid molecule is able to intermolecularly cleave RNA and thereby inactivate a target RNA molecule. These complementary regions allow sufficient hybridization of the enzymatic nucleic acid molecule to the target RNA and thus permit cleavage. One hundred percent complementarity is preferred, but complementarity as low as 50-75% may also be useful in this invention. The nucleic acids may be modified at the base, sugar, and/or phosphate groups. The term enzymatic nucleic acid is used interchangeably with phrases such as ribozymes, catalytic RNA, enzymatic RNA, catalytic DNA, aptazyme or aptamer-binding ribozyme, regulatable ribozyme, catalytic oligonucleotides, nucleozyme, DNAzyme, RNA enzyme, endoribonuclease, endonuclease, minizyme, leadzyme, oligozyme or DNA enzyme. All of these terminologies describe nucleic acid molecules with enzymatic activity. The specific enzymatic nucleic acid molecules described in the instant application are not meant to be limiting and those skilled in the art will recognize that all that is important in an enzymatic nucleic acid molecule of this invention is that it have a specific substrate binding site which is complementary to one or more of the target nucleic acid regions, and that it have nucleotide sequences within or surrounding that substrate binding site which impart a nucleic acid cleaving activity to the molecule (Cech et al., U.S. Patent No. 4,987,071; Cech et al., 1988, JAMA 260:20 3030-4).

By "nucleic acid molecule" as used herein is meant a molecule having nucleotides. The nucleic acid can be single, double, or multiple stranded and may comprise modified or unmodified nucleotides or non-nucleotides or various mixtures and combinations thereof.

An example of a nucleic acid molecule according to the invention is a gene which encodes for a macromolecule such as a protein.

By "enzymatic portion" or "catalytic domain" is meant that portion/region of the enzymatic nucleic acid molecule essential for cleavage of a nucleic acid substrate (for example see **Figures 1-5**).

By "substrate binding arm" or "substrate binding domain" is meant that portion/region of a ribozyme which is complementary to (*i.e.*, able to base-pair with) a portion of its substrate. Generally, such complementarity is 100%, but can be less if desired. For example, as few as 10 bases out of 14 may be base-paired. Such arms are shown generally in **Figures 1-5**. That is, these arms contain sequences within a ribozyme which are intended to bring ribozyme and target RNA together through complementary base-pairing interactions. The ribozyme of the invention may have binding arms that are contiguous or non-contiguous and may be of varying lengths. The length of the binding arm(s) are preferably greater than or equal to four nucleotides and of sufficient length to stably interact with the target RNA; specifically 12-100 nucleotides; more specifically 14-24 nucleotides long. If two binding arms are chosen, the design is such that the length of the binding arms are symmetrical (*i.e.*, each of the binding arms is of the same length; *e.g.*, five and five nucleotides, six and six nucleotides or seven and seven nucleotides long) or asymmetrical (*i.e.*, the binding arms are of different length; *e.g.*, six and three nucleotides; three and six nucleotides long; four and five nucleotides long; four and six nucleotides long; four and seven nucleotides long; and the like). Binding arms can be complementary to the specified substrate, to a portion of the indicated substrate, to the indicated substrate sequence and additional adjacent sequence, or a portion of the indicated sequence and additional adjacent sequence.

By "NCH" or "Inozyme" motif is meant, an enzymatic nucleic acid molecule comprising a motif as described in Ludwig *et al.*, USSN No. 09/406,643, filed September 27, 1999, entitled "COMPOSITIONS HAVING RNA CLEAVING ACTIVITY", and International PCT publication Nos. WO 98/58058 and WO 98/58057, all incorporated by reference herein in their entirety, including the drawings.

By "G-cleaver" motif is meant, an enzymatic nucleic acid molecule comprising a motif as described in Eckstein *et al.*, International PCT publication No. WO 99/16871, incorporated by reference herein in its entirety, including the drawings.

By "zinzyme" motif is meant, a class II enzymatic nucleic acid molecule comprising a motif as described herein and in Beigelman *et al.,* International PCT publication No. WO 99/55857, incorporated by reference herein in its entirety, including the drawings.

By "amberzyme" motif is meant, a class I enzymatic nucleic acid molecule comprising a motif as described herein and in Beigelman *et al.,* International PCT publication No. WO 99/55857, incorporated by reference herein in its entirety, including the drawings.

By 'DNAzyme' is meant, an enzymatic nucleic acid molecule lacking a ribonucleotide (2'-OH) group. In particular embodiments, the enzymatic nucleic acid molecule may have an attached linker(s) or other attached or associated groups, moieties, or chains containing one or more nucleotides with 2'-OH groups. A DNAzyme can be synthesized chemically or can be expressed by means of a single stranded DNA vector or equivalent thereof.

By "sufficient length" is meant an oligonucleotide of greater than or equal to 3 nucleotides that is of a length great enough to provide the intended function under the expected condition. For example, for binding arms of enzymatic nucleic acid "sufficient length" means that the binding arm sequence is long enough to provide stable binding to a target site under the expected binding conditions. Preferably, the binding arms are not so long as to prevent useful turnover.

By "stably interact" is meant, interaction of the oligonucleotides with target nucleic acid (*e.g.,* by forming hydrogen bonds with complementary nucleotides in the target under physiological conditions).

By "equivalent" RNA to PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV is meant to include those naturally occurring RNA molecules having homology (partial or complete) to PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV proteins or encoding for proteins with similar function as PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV in various organisms, including human, rodent, primate, rabbit, pig, protozoans, fungi, plants, and other microorganisms and parasites. The equivalent RNA sequence also includes in addition to the coding region, regions such as 5'-untranslated region, 3'-untranslated region, introns, intron-exon junction and the like in HBV.

By “homology” is meant the nucleotide sequence of two or more nucleic acid molecules is partially or completely identical.

By “antisense nucleic acid”, it is meant a non-enzymatic nucleic acid molecule that binds to target RNA by means of RNA-RNA or RNA-DNA or RNA-PNA (protein nucleic acid; Egholm *et al.,* 1993 *Nature* 365, 566) interactions and alters the activity of the target RNA (for a review, see Stein and Cheng, 1993 *Science* 261, 1004 and Woolf *et al.,* US patent No. 5,849,902). Typically, antisense molecules will be complementary to a target sequence along a single contiguous sequence of the antisense molecule. However, in certain embodiments, an antisense molecule may bind to substrate such that the substrate molecule forms a loop, and/or an antisense molecule may bind such that the antisense molecule forms a loop. Thus, the antisense molecule may be complementary to two (or even more) non-contiguous substrate sequences or two (or even more) non-contiguous sequence portions of an antisense molecule may be complementary to a target sequence or both. For a review of current antisense strategies, see Schmajuk *et al.,* 1999, *J. Biol. Chem.,* 274, 21783-21789, Delihas *et al.,* 1997, *Nature,* 15, 751-753, Stein *et al.,* 1997, *Antisense N. A. Drug Dev.,* 7, 151, Crooke, 1998, *Biotech. Genet. Eng. Rev.,* 15, 121-157, Crooke, 1997, *Ad. Pharmacol.,* 40, 1-49. In addition, antisense DNA can be used to target RNA by means of DNA-RNA interactions, thereby activating RNase H, which digests the target RNA in the duplex. Antisense DNA can be synthesized chemically or can be expressed via the use of a single stranded DNA expression vector or the equivalent thereof.

By "2-5A antisense chimera" it is meant, an antisense oligonucleotide containing a 5'-phosphorylated 2'-5'-linked adenylate residue. These chimeras bind to target RNA in a sequence-specific manner and activate a cellular 2-5A-dependent ribonuclease which, in turn, cleaves the target RNA (Torrence *et al.,* 1993 *Proc. Natl. Acad. Sci. USA* 90, 1300).

By "triplex DNA" it is meant an oligonucleotide that can bind to a double-stranded DNA in a sequence-specific manner to form a triple-strand helix. Formation of such triple helix structure has been shown to inhibit transcription of the targeted gene (Duval-Valentin *et al.,* 1992, *Proc. Natl. Acad. Sci.USA,* 89, 504).

By "gene" it is meant a nucleic acid that encodes a RNA.

By "complementarity" is meant that a nucleic acid can form hydrogen bond(s) with another RNA sequence by either traditional Watson-Crick or other non-traditional types. In reference to the nucleic molecules of the present invention, the binding free energy for a nucleic acid molecule with its target or complementary sequence is sufficient to allow the relevant function of the nucleic acid to proceed, e.g., ribozyme cleavage, antisense or triple helix inhibition. Determination of binding free energies for nucleic acid molecules is well known in the art (see, e.g., Turner et al., 1987, *CSH Symp. Quant. Biol.* LII pp.123-133; Frier et al., 1986, *Proc. Nat. Acad. Sci.* USA 83:9373-9377; Turner et al., 1987, *J. Am. Chem. Soc.* 109:3783-3785). A percent complementarity indicates the percentage of contiguous residues in a nucleic acid molecule which can form hydrogen bonds (e.g., Watson-Crick base pairing) with a second nucleic acid sequence (e.g., 5, 6, 7, 8, 9, 10 out of 10 being 50%, 60%, 70%, 80%, 90%, and 100% complementary). "Perfectly complementary" means that all the contiguous residues of a nucleic acid sequence will hydrogen bond with the same number of contiguous residues in a second nucleic acid sequence.

At least seven basic varieties of naturally-occurring enzymatic RNAs are known presently. Each can catalyze the hydrolysis of RNA phosphodiester bonds in *trans* (and thus can cleave other RNA molecules) under physiological conditions. **Table I** summarizes some of the characteristics of these ribozymes. In general, enzymatic nucleic acids act by first binding to a target RNA. Such binding occurs through the target binding portion of a enzymatic nucleic acid which is held in close proximity to an enzymatic portion of the molecule that acts to cleave the target RNA. Thus, the enzymatic nucleic acid first recognizes and then binds a target RNA through complementary base-pairing, and once bound to the correct site, acts enzymatically to cut the target RNA. Strategic cleavage of such a target RNA will destroy its ability to direct synthesis of an encoded protein. After an enzymatic nucleic acid has bound and cleaved its RNA target, it is released from that RNA to search for another target and can repeatedly bind and cleave new targets. Thus, a single ribozyme molecule is able to cleave many molecules of target RNA. In addition, the ribozyme is a highly specific inhibitor of gene expression, with the specificity of inhibition depending not only on the base-pairing mechanism of binding to the target RNA, but also on the mechanism of target RNA cleavage. Single mismatches,

or base-substitutions, near the site of cleavage can completely eliminate catalytic activity of a ribozyme.

The enzymatic nucleic acid molecule that cleave the specified sites in PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV-specific RNAs represent a novel therapeutic approach to treat a variety of pathologic indications, including, HBV infection, hepatitis, hepatocellular carcinoma, tumorigenesis, cirrhosis, liver failure, cancers including breast, ovarian, prostate, and esophogeal cancer, tumorigenesis, retinopathy, arthritis, psoriasis, female reproduction, restinosis, certain infectious diseases, transplant rejection and autoimmune disease such as multiple sclerosis, lupus, and AIDS, age related diseases such as macular degeneration and skin ulceration, Alzheimer's disease, dementia, diabetes, obesity and any other condition related to the level of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV in a cell or tissue.

In one of the preferred embodiments of the inventions described herein, the enzymatic nucleic acid molecule is formed in a hammerhead or hairpin motif, but may also be formed in the motif of a hepatitis delta virus, group I intron, group II intron or RNase P RNA (in association with an RNA guide sequence), *Neurospora* VS RNA, DNAzymes, NCH cleaving motifs, or G-cleavers. Examples of such hammerhead motifs are described by Dreyfus, *supra,* Rossi *et al.*, 1992, *AIDS Research and Human Retroviruses* 8, 183. Examples of hairpin motifs are described by Hampel *et al.*, EP0360257, Hampel and Tritz, 1989 *Biochemistry* 28, 4929, Feldstein *et al.*, 1989, *Gene* 82, 53, Haseloff and Gerlach, 1989, *Gene*, 82, 43, Hampel *et al.*, 1990 *Nucleic Acids Res*. 18, 299; and Chowrira & McSwiggen, US. Patent No. 5,631,359. The hepatitis delta virus motif is described by Perrotta and Been, 1992 *Biochemistry* 31, 16. The RNase P motif is described by Guerrier-Takada *et al.*, 1983 *Cell* 35, 849; Forster and Altman, 1990, *Science* 249, 783; and Li and Altman, 1996, *Nucleic Acids Res.* 24, 835. The *Neurospora* VS RNA ribozyme motif is described by Collins (Saville and Collins, 1990 *Cell* 61, 685-696; Saville and Collins, 1991 *Proc. Natl. Acad. Sci. USA* 88, 8826-8830; Collins and Olive, 1993 *Biochemistry* 32, 2795-2799; and Guo and Collins, 1995, *EMBO. J.* 14, 363). Group II introns are described by Griffin *et al.*, 1995, *Chem. Biol.* 2, 761; Michels and Pyle, 1995, *Biochemistry* 34, 2965; and Pyle *et al.,* International PCT Publication No. WO 96/22689. The Group I intron is described by Cech *et al.*, U.S. Patent 4,987,071. DNAzymes are described by Usman *et al.*, International PCT Publication No. WO 95/11304; Chartrand *et*

al., 1995, *NAR* 23, 4092; Breaker *et al.*, 1995, *Chem. Bio.* 2, 655; and Santoro *et al.*, 1997, *PNAS* 94, 4262. NCH cleaving motifs are described in Ludwig & Sproat, International PCT Publication No. WO 98/58058; and G-cleavers are described in Kore *et al.*, 1998, *Nucleic Acids Research* 26, 4116-4120 and Eckstein *et al.*, International PCT Publication No. WO 99/16871. Additional motifs include the Aptazyme (Breaker *et al.*, WO 98/43993), Amberzyme (Class I motif; **Figure 3**; Beigelman *et al.*, International PCT publication No. WO 99/55857) and Zinzyme (Beigelman *et al.*, International PCT publication No. WO 99/55857), all these references are incorporated by reference herein in their totalities, including drawings and can also be used in the present invention. These specific motifs are not limiting in the invention and those skilled in the art will recognize that all that is important in an enzymatic nucleic acid molecule of this invention is that it has a specific substrate binding site which is complementary to one or more of the target gene RNA regions, and that it have nucleotide sequences within or surrounding that substrate binding site which impart an RNA cleaving activity to the molecule (Cech *et al.*, U.S. Patent No. 4,987,071).

In preferred embodiments of the present invention, a nucleic acid molecule, *e.g.*, an antisense molecule, a triplex DNA, or a ribozyme, is 13 to 100 nucleotides in length, *e.g.*, in specific embodiments 35, 36, 37, or 38 nucleotides in length (*e.g.*, for particular ribozymes or antisense). In particular embodiments, the nucleic acid molecule is 15-100, 17-100, 20-100, 21-100, 23-100, 25-100, 27-100, 30-100, 32-100, 35-100, 40-100, 50-100, 60-100, 70-100, or 80-100 nucleotides in length. Instead of 100 nucleotides being the upper limit on the length ranges specified above, the upper limit of the length range can be, for example, 30, 40, 50, 60, 70, or 80 nucleotides. Thus, for any of the length ranges, the length range for particular embodiments has lower limit as specified, with an upper limit as specified which is greater than the lower limit. For example, in a particular embodiment, the length range can be 35-50 nucleotides in length. All such ranges are expressly included. Also in particular embodiments, a nucleic acid molecule can have a length which is any of the lengths specified above, for example, 21 nucleotides in length.

In a preferred embodiment, the invention provides a method for producing a class of nucleic acid–based gene inhibiting agents which exhibit a high degree of specificity for the RNA of a desired target. For example, the enzymatic nucleic acid molecule is preferably targeted to a highly conserved sequence region of target RNAs encoding PTP-1B, MetAP-

2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV proteins (specifically PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV RNA) such that specific treatment of a disease or condition can be provided with either one or several nucleic acid molecules of the invention. Such nucleic acid molecules can be delivered exogenously to specific tissue or cellular targets as required. Alternatively, the nucleic acid molecules (*e.g.,* ribozymes and antisense) can be expressed from DNA and/or RNA vectors that are delivered to specific cells.

As used in herein "cell" is used in its usual biological sense, and does not refer to an entire multicellular organism, e.g., specifically does not refer to a human. The cell may be present in an organism which may be a human but is preferably a non-human multicellular organism, e.g., birds, plants and mammals such as cows, sheep, apes, monkeys, swine, dogs, and cats. The cell may be prokaryotic (e.g., bacterial cell) or eukaryotic (e.g., mammalian or plant cell).

By "PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV proteins" is meant, a protein or a mutant protein derivative thereof, comprising sequence expressed and/or encoded by PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, genes and/or the HBV genome respectively.

By "highly conserved sequence region" is meant a nucleotide sequence of one or more regions in a target gene does not vary significantly from one generation to the other or from one biological system to the other.

The enzymatic nucleic acid-based inhibitors of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV expression are useful for the prevention of the diseases and conditions including HBV infection, hepatitis, hepatocellular carcinoma, tumorigenesis, cirrhosis, liver failure, cancers including breast, ovarian, prostate, and esophogeal cancer, tumorigenesis, retinopathy, arthritis, psoriasis, female reproduction, restinosis, certain infectious diseases, transplant rejection and autoimmune disease such as multiple sclerosis, lupus, and AIDS, age related diseases such as macular degeneration and skin ulceration, Alzheimer's disease, dementia, diabetes, obesity and any other condition related to the level of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV in a cell or tissue. and any other diseases or conditions that are related to the levels of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV in a cell or tissue.

By "related" is meant that the reduction of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV expression (specifically PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV genes) RNA levels and thus reduction in the level of the respective protein will relieve, to some extent, the symptoms of the disease or condition.

The nucleic acid-based inhibitors of the invention are added directly, or can be complexed with cationic lipids, packaged within liposomes, or otherwise delivered to target cells or tissues. The nucleic acid or nucleic acid complexes can be locally administered to relevant tissues *ex vivo*, or *in vivo* through injection, infusion pump or stent, with or without their incorporation in biopolymers. In preferred embodiments, the enzymatic nucleic acid inhibitors comprise sequences, which are complementary to the substrate sequences in **Tables 3-31, 33, 34, 36-43, 56, 58, 59, 62, 63**. Examples of such enzymatic nucleic acid molecules also are shown in **Tables 3-29, 31, 33, 34, 37-43, 56, 58, 59, 62, 63**. Examples of such enzymatic nucleic acid molecules consist essentially of sequences defined in these tables.

In yet another embodiment, the invention features antisense nucleic acid molecules including sequences complementary to the substrate sequences shown in **Tables 3-31, 33, 34, 36, 37-43, 56, 58, 59, 62, 63**. Such nucleic acid molecules can include sequences as shown for the binding arms of the enzymatic nucleic acid molecules in **Tables 3-29, 31, 33, 34, 37-43, 56, 58, 59, 62, 63**. Similarly, triplex molecules can be provided targeted to the corresponding DNA target regions, and containing the DNA equivalent of a target sequence or a sequence complementary to the specified target (substrate) sequence. Typically, antisense molecules will be complementary to a target sequence along a single contiguous sequence of the antisense molecule. However, in certain embodiments, an antisense molecule may bind to substrate such that the substrate molecule forms a loop, and/or an antisense molecule may bind such that the antisense molecule forms a loop. Thus, the antisense molecule may be complementary to two (or even more) non-contiguous substrate sequences or two (or even more) non-contiguous sequence portions of an antisense molecule may be complementary to a target sequence or both.

In another aspect, the invention provides mammalian cells containing one or more nucleic acid molecules and/or expression vectors of this invention. The one or more nucleic acid molecules may independently be targeted to the same or different sites.

By "consists essentially of" is meant that the active nucleic acid molecule of the invention, for example, an enzymatic nucleic acid molecule, contains an enzymatic center or core equivalent to those in the examples, and binding arms able to bind mRNA such that cleavage at the target site occurs. Other sequences may be present which do not interfere with such cleavage. Thus, a core region may, for example, include one or more loop or stem-loop structures, which do not prevent enzymatic activity. "X" in the sequences in **Tables 3, 4, 9, 10, 13, 14, 18, 19, 24, 25, 33, 34, 37, 38, 63** can be such a loop. A core sequence for a hammerhead ribozyme can be CUGAUGAG X CGAA where X=GCCGUUAGGC or other stem II region as specifically or generally known in the art.

In another aspect of the invention, ribozymes or antisense molecules that interact with target RNA molecules and inhibit PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV (specifically PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV RNA) activity are expressed from transcription units inserted into DNA or RNA vectors. The recombinant vectors are preferably DNA plasmids or viral vectors. Ribozyme or antisense expressing viral vectors could be constructed based on, but not limited to, adeno-associated virus, retrovirus, adenovirus, or alphavirus. Preferably, the recombinant vectors capable of expressing the ribozymes or antisense are delivered as described above, and persist in target cells. Alternatively, viral vectors may be used that provide for transient expression of ribozymes or antisense. Such vectors might be repeatedly administered as necessary. Once expressed, the ribozymes or antisense bind to the target RNA and inhibit its function or expression. Delivery of ribozyme or antisense expressing vectors could be systemic, such as by intravenous or intramuscular administration, by administration to target cells ex-planted from the patient followed by reintroduction into the patient, or by any other means that would allow for introduction into the desired target cell. Antisense DNA can be expressed via the use of a single stranded DNA intracellular expression vector.

By RNA is meant a molecule comprising at least one ribonucleotide residue. By "ribonucleotide" is meant a nucleotide with a hydroxyl group at the 2' position of a β-D-ribo-furanose moiety.

By "vectors" is meant any nucleic acid- and/or viral-based technique used to deliver a desired nucleic acid.

By "patient" is meant an organism, which is a donor or recipient of explanted cells or the cells themselves. "Patient" also refers to an organism to which the nucleic acid molecules of the invention can be administered. Preferably, a patient is a mammal or mammalian cells. More preferably, a patient is a human or human cells.

The nucleic acid molecules of the instant invention, individually, or in combination or in conjunction with other drugs, can be used to treat diseases or conditions discussed above. For example, to treat a disease or condition associated with PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV, the patient may be treated, or other appropriate cells may be treated, as is evident to those skilled in the art, individually or in combination with one or more drugs under conditions suitable for the treatment.

In a further embodiment, the described molecules, such as antisense or ribozymes, can be used in combination with other known treatments to treat conditions or diseases discussed above. For example, the described molecules could be used in combination with one or more known therapeutic agents to treat HBV infection, hepatitis, hepatocellular carcinoma, tumorigenesis, cirrhosis, liver failure, cancers including breast, ovarian, prostate, and esophogeal cancer, tumorigenesis, retinopathy, arthritis, psoriasis, female reproduction, restinosis, certain infectious diseases, transplant rejection and autoimmune disease such as multiple sclerosis, lupus, and AIDS, age related diseases such as macular degeneration and skin ulceration, Alzheimer's disease, dementia, diabetes, and/or obesity.

In another preferred embodiment, the invention features nucleic acid-based inhibitors (*e.g.*, enzymatic nucleic acid molecules (ribozymes), antisense nucleic acids, triplex DNA, antisense nucleic acids containing RNA cleaving chemical groups) and methods for their use to down regulate or inhibit the expression of RNA (*e.g.*, PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV) capable of progression and/or maintenance of HBV infection, hepatitis, hepatocellular carcinoma, tumorigenesis, cirrhosis, liver failure, cancers including breast, ovarian, prostate, and esophogeal cancer, tumorigenesis, retinopathy, arthritis, psoriasis, female reproduction, restinosis, certain infectious diseases, transplant rejection and autoimmune disease such as multiple sclerosis, lupus, and AIDS, age related diseases such as macular degeneration and skin ulceration, Alzheimer's disease, dementia, diabetes, and/or obesity.

In another preferred embodiment, the invention features nucleic acid-based techniques (*e.g.*, enzymatic nucleic acid molecules (ribozymes), antisense nucleic acids, triplex DNA, antisense nucleic acids containing RNA cleaving chemical groups) and methods for their use to down regulate or inhibit the expression of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV RNA expression.

By "comprising" is meant including, but not limited to, whatever follows the word "comprising". Thus, use of the term "comprising" indicates that the listed elements are required or mandatory, but that other elements are optional and may or may not be present. By "consisting of" is meant including, and limited to, whatever follows the phrase "consisting of". Thus, the phrase "consisting of" indicates that the listed elements are required or mandatory, and that no other elements may be present. By "consisting essentially of" is meant including any elements listed after the phrase, and limited to other elements that do not interfere with or contribute to the activity or action specified in the disclosure for the listed elements. Thus, the phrase "consisting essentially of" indicates that the listed elements are required or mandatory, but that other elements are optional and may or may not be present depending upon whether or not they affect the activity or action of the listed elements.

Other features and advantages of the invention will be apparent from the following description of the preferred embodiments thereof, and from the claims.

Description Of The Preferred Embodiments

The drawings will first briefly be described.

Drawings:

Figure 1 shows the secondary structure model for seven different classes of enzymatic nucleic acid molecules. Arrow indicates the site of cleavage. --------- indicate the target sequence. Lines interspersed with dots are meant to indicate tertiary interactions. - is meant to indicate base-paired interaction. **Group I Intron**: P1-P9.0 represent various stem-loop structures (Cech *et al.*, 1994, *Nature Struc. Bio.*, 1, 273). **RNase P (M1RNA)**: EGS represents external guide sequence (Forster *et al.*, 1990, *Science*, 249, 783; Pace *et al.*, 1990, *J. Biol. Chem.*, 265, 3587). **Group II Intron:** 5'SS means 5' splice site; 3'SS means 3'-splice site; IBS means intron binding site; EBS means exon binding site (Pyle *et*

al., 1994, *Biochemistry*, 33, 2716). **VS RNA:** I-VI are meant to indicate six stem-loop structures; shaded regions are meant to indicate tertiary interaction (Collins, International PCT Publication No. WO 96/19577). **HDV Ribozyme:** I-IV are meant to indicate four stem-loop structures (Been *et al.*, US Patent No. 5,625,047). **Hammerhead Ribozyme:** I-III are meant to indicate three stem-loop structures; stems I-III can be of any length and may be symmetrical or asymmetrical (Usman *et al.*, 1996, *Curr. Op. Struct. Bio.*, 1, 527). **Hairpin Ribozyme:** Helix 1, 4 and 5 can be of any length; Helix 2 is between 3 and 8 base-pairs long; Y is a pyrimidine; Helix 2 (H2) is provided with a least 4 base pairs (*i.e.*, n is 1, 2, 3 or 4) and helix 5 can be optionally provided of length 2 or more bases (preferably 3 - 20 bases, *i.e.*, m is from 1 - 20 or more). Helix 2 and helix 5 may be covalently linked by one or more bases (*i.e.*, r is ≥ 1 base). Helix 1, 4 or 5 may also be extended by 2 or more base pairs (*e.g.*, 4 - 20 base pairs) to stabilize the ribozyme structure, and preferably is a protein binding site. In each instance, each N and N' independently is any normal or modified base and each dash represents a potential base-pairing interaction. These nucleotides may be modified at the sugar, base or phosphate. Complete base-pairing is not required in the helices, but is preferred. Helix 1 and 4 can be of any size (*i.e.*, o and p is each independently from 0 to any number, *e.g.*, 20) as long as some base-pairing is maintained. Essential bases are shown as specific bases in the structure, but those in the art will recognize that one or more may be modified chemically (abasic, base, sugar and/or phosphate modifications) or replaced with another base without significant effect. Helix 4 can be formed from two separate molecules, *i.e.*, without a connecting loop. The connecting loop when present may be a ribonucleotide with or without modifications to its base, sugar or phosphate. "q" ≥ is 2 bases. The connecting loop can also be replaced with a non-nucleotide linker molecule. H refers to bases A, U, or C. Y refers to pyrimidine bases. "_____" refers to a covalent bond. (Burke *et al.*, 1996, *Nucleic Acids & Mol. Biol.*, 10, 129; Chowrira *et al.*, US Patent No. 5,631,359).

Figure 2 shows examples of chemically stabilized ribozyme motifs. **HH Rz**, represents hammerhead ribozyme motif (Usman *et al.*, 1996, *Curr. Op. Struct. Bio.*, 1, 527); **NCH Rz** represents the NCH ribozyme motif (described herein and in Ludwig & Sproat, International PCT Publication No. WO 98/58058); **G-Cleaver,** represents G-cleaver ribozyme motif (Kore *et al.*, 1998, *Nucleic Acids Research*, 26, 4116-4120). N or

n, represent independently a nucleotide which may be same or different and have complementarity to each other; **rI**, represents ribo-Inosine nucleotide; arrow indicates the site of cleavage within the target. Position 4 of the HH Rz and the NCH Rz is shown as having 2'-*C*-allyl modification, but those skilled in the art will recognize that this position can be modified with other modifications well known in the art, so long as such modifications do not significantly inhibit the activity of the ribozyme.

Figure 3 shows an example of the Amberzyme ribozyme motif that is chemically stabilized (see, for example, Beigelman *et al.,* International PCT publication No. WO 99/55857; also referred to as Class I Motif). The Amberzyme motif is a class of enzymatic nucleic acid molecules that do not require the presence of a ribonucleotide (2'-OH) group for activity.

Figure 4 shows an example of the Zinzyme A ribozyme motif that is chemically stabilized (see, for example, International PCT publication No. WO 99/55857; also referred to as Class A Motif). The Zinzyme motif is a class of enzymatic nucleic acid molecules that do not require the presence of a ribonucleotide (2'-OH) group for activity.

Figure 5 shows an example of a DNAzyme motif described by Santoro et al., 1997, PNAS, 94, 4262.

Figure 6 is a diagrammatic representation of the hammerhead ribozyme motif known in the art and the NCH motif. Stem II can be 2 base-pair long, preferably, 2, 3, 4, 5, 6, 7, 8, and 10 base-pairs long. Each N and N' is independently any base or non-nucleotide as used herein; X is adenosine, cytidine or uridine; Stem I-III are meant to indicate three stem-loop structures; stems I-III can be of any length and may be symmetrical or asymmetrical (Usman *et al.,* 1996, *Curr. Op. Struct. Bio.,* 1, 527); arrow indicates the site of cleavage in the target RNA; Rz refers to ribozyme; Loop II may be present or absent. If Loop II is present it is greater than or equal to three nucleotides, preferably four nucleotides. The Loop II sequence is preferably 5'-GAAA-3' or 5'-GUUA-3'.

Figure 7 shows examples of chemically stabilized ribozyme motifs. **HH Rz,** represents hammerhead ribozyme motif (Usman *et al.,* 1996, *Curr. Op. Struct. Bio.,* 1, 527); **NCH-Inosine Rz** represents the NCH ribozyme motif with riboinosine at 15.1 position; **NCH-Xylo Rz** represents the NCH ribozyme with xylo inosine at 15.1 position. N or **n**, represent independently a nucleotide which may be same or different and may have

complementarity to each other; **rI**, represents ribo-Inosine nucleotide; **xI** represent xylo-inosine; arrow indicates the site of cleavage within the target. Position 4 of the HH Rz and the NCH Rzs is shown as having 2'-*C*-allyl modification, but those skilled in the art will recognize that this position can be modified with other modifications well known in the art, so long as such modifications do not significantly inhibit the activity of the ribozyme.

Figure 8 is a graphical representation of data showing inhibition of cell proliferation mediated by NCH and HH ribozymes targeted against HER2/*neu*/ErbB2 gene. Untreated, refers to cells not treated with ribozymes; HH RZ refers to hammerhead ribozyme; NCX RZ refers to the NCH ribozymes of the invention; IA refers to catalytically inactive or attenuated ribozyme used as a control.

Figure 9 is a schematic diagram of the process for the synthesis of beta-D-xylofuranosyl hypoxantine 3'-phosphoramidite.

Figure 10 displays a schematic representation of NTP synthesis using nucleoside substrates.

Figure 11 shows a scheme for an in vitro selection method. A pool of nucleic acid molecules is generated with a random core region and one or more region(s) with a defined sequence. These nucleic acid molecules are bound to a column containing immobilized oligonucleotide with a defined sequence, where the defined sequence is complementary to region(s) of defined sequence of nucleic acid molecules in the pool. Those nucleic acid molecules capable of cleaving the immobilized oligonucleotide (target) in the column are isolated and converted to complementary DNA (cDNA), followed by transcription using NTPs to form a new nucleic acid pool.

Figure 12 shows a scheme for a two column in vitro selection method. A pool of nucleic acid molecules is generated with a random core and two flanking regions (region A and region B) with defined sequences. The pool is passed through a column which has immobilized oligonucleotides with regions A' and B' that are complementary to regions A and B of the nucleic acid molecules in the pool, respectively. The column is subjected to conditions sufficient to facilitate cleavage of the immobilized oligonucleotide target. The molecules in the pool that cleave the target (active molecules) have A' region of the target bound to their A region, whereas the B region is free. The column is washed to isolate the active molecules with the bound A' region of the target. This pool of active molecules may also contain some molecules that are not active to cleave the target (inactive

molecules) but have dissociated from the column. To separate the contaminating inactive molecules from the active molecules, the pool is passed through a second column (column 2) which contains immobilized oligonucleotides with the A' sequence but not the B' sequence. The inactive molecules will bind to column 2 but the active molecules will not bind to column 2 because their A region is occupied by the A' region of the target oligonucleotide from column 1. Column 2 is washed to isolate the active molecules for further processing as described in the scheme shown in **Figure 11**.

Figure 13 is a diagram of a novel 48 nucleotide enzymatic nucleic acid motif which was identified using in vitro methods described in the instant invention. The molecule shown is only exemplary. The 5' and 3' terminal nucleotides (referring to the nucleotides of the substrate binding arms rather than merely the single terminal nucleotide on the 5' and 3' ends) can be varied so long as those portions can base-pair with target substrate sequence. In addition, the guanosine (G) shown at the cleavage site of the substrate can be changed to other nucleotides so long as the change does not eliminate the ability of enzymatic nucleic acid molecules to cleave the target sequence. Substitutions in the nucleic acid molecule and/or in the substrate sequence can be readily tested, for example, as described herein.

Figure 14 is a schematic diagram of HCV luciferase assay used to demonstrate efficacy of class I enzymatic nucleic acid molecule motif.

Figure 15 is a graph indicating the dose curve of an enzymatic nucleic acid molecule targeting site 146 on HCV RNA.

Figure 16 is a bar graph showing enzymatic nucleic acid molecules targeting 4 sites within the HCV RNA are able to reduce RNA levels in cells.

Figure 17 shows secondary structures and cleavage rates for characterized Class II enzymatic nucleic acid motifs.

Figure 18 is a diagram of a novel 35 nucleotide enzymatic nucleic acid motif which was identified using in vitro methods described in the instant invention. The molecule shown is only exemplary. The 5' and 3' terminal nucleotides (referring to the nucleotides of the substrate binding arms rather than merely the single terminal nucleotide on the 5' and 3' ends) can be varied so long as those portions can base-pair with target substrate sequence. In addition, the guanosine (G) shown at the cleavage site of the substrate can be changed to other nucleotides so long as the change does not eliminate the ability of

enzymatic nucleic acid molecules to cleave the target sequence. Substitutions in the nucleic acid molecule and/or in the substrate sequence can be readily tested, for example, as described herein.

Figure 19 is a bar graph showing substrate specificities for Class II (zinzyme) ribozymes.

Figure 20 is a bar graph showing Class II enzymatic nucleic acid molecules targeting 10 representative sites within the HER2 RNA in a cellular proliferation screen.

Figure 21 is a synthetic scheme outlining the synthesis of 5-[3-aminopropynyl(propyl)]uridine 5'-triphosphates and 4-imidazoleaceticacid conjugates.

Figure 22 is a synthetic scheme outlining the synthesis of 5-[3-(N-4-imidazoleacetyl)aminopropynyl(propyl)]uridine 5'-triphosphates.

Figure 23 is a synthetic scheme outlining the synthesis of carboxylate tethered uridine 5'-triphosphoates.

Figure 24 is a synthetic scheme outlining the synthesis of 5-(3-aminoalkyl) and 5-[3(N-succinyl)aminopropyl] functionalized cytidines.

Figure 25 is a diagram of a class I ribozyme stem truncation and loop replacement analysis.

Figure 26 is a diagram of class I ribozymes with truncated stem(s) and/or non-nucleotide linkers used in loop structures.

Figure 27 is a diagram of "no-ribo" class II ribozymes.

Figure 28 is a graph showing cleavage reactions with class II ribozymes under differing divalent metal concentrations.

Figure 29 is a diagram of differing class II ribozymes with varying ribo content and their relative rates of catalysis.

Figure 30 is a graph showing class II ribozyme (zinzyme) mediated reduction of HER2 RNA in SKBR3 breast carcinoma cells. Cells were treated with 100 nm, and 200 nm of zinzyme (RPI 18656) targeting site 972 of HER2 RNA and a corresponding scrambled attenuated control complexed with 2.5 μg/ml of lipid. Active zinzymes and scrambled attenuated controls were compared to untreated cells after 24 hours post treatment.

Figure 31 is a graph showing class II ribozyme (zinzyme) mediated dose response anti-prolferation assay in SKBR3 breast carcinoma cells. Cells were treated with 100 nm, and 200 nm of zinzyme (RPI 18656) targeting site 972 of HER2 RNA and a corresponding scrambled attenuated control complexed with 2.0 μg/ml of lipid. Active zinzymes and scrambled attenuated controls were compared to untreated cells after 24 hours post treatment.

Figure 32 is a graph which shows the dose dependent reduction of HER2 RNA in SKOV-3 cells treated with RPI 19293 from 0 to 100 nM with 5.0 μg/ml of cationic lipid.

Figure 33 is a graph which shows the dose dependent reduction of HER2 RNA and inhibition of cellular proliferation in SKBR-3 cells treated with RPI 19293 from 0 to 400 nM with 5.0 μg/ml of cationic lipid.

Figure 34 shows a non-limiting example of the replacement of a 2'-O-methyl 5'-CA-3' with a ribo G in the class II (zinzyme) motif. The representative motif shown for the purpose of the figure is a "seven-ribo" zinzyme motif, however, the interchangeability of a G and a CA in the position shown in **Figure 25** of the class II (zinzyme) motif extends to any combination of 2-O-methyl and ribo residues. For instance, a 2'-O-methyl G can replace the 2'-O-methyl 5'-CA-3' and vise versa.

Figure 35 is a graph which shows a screen of class II ribozymes (zinzymes) targeting site 972 of HER2 RNA which contain ribo-G reductions (RPI 19727 = no ribo, RPI 19728 = one ribo, RPI 19293 = two ribo, RPI 19729 = three ribo, RPI 19730 = four ribo, 19731 = five ribo, and RPI 19292 = seven ribo) for anti-proliferative activity in SKBR3 cells.

Figure 36 summarizes the results of functional group modification studies in which various nucleoside analogs were tested for activity in the NCH ribozyme motif. K_{rel} values describe the cleavage values of a given substituent at position 15.1 relative the Inosine at position 15.1 (I-15.1).

Figure 37 summarizes reported functional group modification studies performed at the A 15.1 residue in the A-15.1 •U-16.1 context of NUH cleaving ribozymes. K_{rel} values describe the cleavage values of a given substituent at position 15.1 relative the adenosine at position 15.1 (A-15.1).

Mechanism of action of Nucleic Acid Molecules of the Invention

Antisense: Antisense molecules may be modified or unmodified RNA, DNA, or mixed polymer oligonucleotides and primarily function by specifically binding to matching sequences resulting in inhibition of peptide synthesis (Wu-Pong, Nov 1994, *BioPharm*, 20-33). The antisense oligonucleotide binds to target RNA by Watson Crick base-pairing and blocks gene expression by preventing ribosomal translation of the bound sequences either by steric blocking or by activating RNase H enzyme. Antisense molecules may also alter protein synthesis by interfering with RNA processing or transport from the nucleus into the cytoplasm (Mukhopadhyay & Roth, 1996, *Crit. Rev. in Oncogenesis* 7, 151-190).

In addition, binding of single stranded DNA to RNA may result in nuclease degradation of the heteroduplex (Wu-Pong, *supra*; Crooke, *supra*). To date, the only backbone modified DNA chemistry which will act as substrates for RNase H are phosphorothioates, phosphorodithioates, and borontrifluoridates. Recently, it has been reported that 2'-arabino and 2'-fluoro arabino- containing oligos can also activate RNase H activity.

A number of antisense molecules have been described that utilize novel configurations of chemically modified nucleotides, secondary structure, and/or RNase H substrate domains (Woolf *et al.*, International PCT Publication No. WO 98/13526; Thompson *et al.*, International PCT Publication No. WO 99/54459 ; Hartmann *et al.*, International PCT Publication No. WO 00/17346) all of these are incorporated by reference herein in their entirety.

Antisense DNA can be used to target RNA by means of DNA-RNA interactions, thereby activating RNase H, which digests the target RNA in the duplex. Antisense DNA can be chemically synthesized or can be expressed via the use of a single stranded DNA intracellular expression vector or the equivalent thereof.

Triplex Forming Oligonucleotides (TFO): Single stranded DNA may be designed to bind to genomic DNA in a sequence specific manner. TFOs are comprised of pyrimidine-rich oligonucleotides which bind DNA helices through Hoogsteen Base-pairing (Wu-Pong, *supra*). The resulting triple helix composed of the DNA sense, DNA antisense, and TFO disrupts RNA synthesis by RNA polymerase. The TFO mechanism may result in gene expression or cell death since binding may be irreversible (Mukhopadhyay & Roth, *supra*)

2'-5' Oligoadenylates: The 2-5 A system is an interferon-mediated mechanism for RNA degradation found in higher vertebrates (Mitra *et al.*, 1996, *Proc Nat Acad Sci USA* 93, 6780-6785). Two types of enzymes, 2-5A synthetase and RNase L, are required for RNA cleavage. The 2-5A synthetases require double stranded RNA to form 2'-5' oligoadenylates (2-5A). 2-5A then acts as an allosteric effector for utilizing RNase L which has the ability to cleave single stranded RNA. The ability to form 2-5A structures with double stranded RNA makes this system particularly useful for inhibition of viral replication.

(2'-5') oligoadenylate structures may be covalently linked to antisense molecules to form chimeric oligonucleotides capable of RNA cleavage (Torrence, *supra*). These molecules putatively bind and activate a 2-5A dependent RNase, the oligonucleotide/enzyme complex then binds to a target RNA molecule which can then be cleaved by the RNase enzyme. The covalent attachment of 2'-5' oligoadenylate structures is not limited to antisense applications, and can be further elaborated to include attachment to nucleic acid molecules of the instant invention.

Enzymatic Nucleic Acid: Seven basic varieties of naturally-occurring enzymatic RNAs are presently known. In addition, several *in vitro* selection (evolution) strategies (Orgel, 1979, *Proc. R. Soc. London,* B 205, 435) have been used to evolve new nucleic acid catalysts capable of catalyzing cleavage and ligation of phosphodiester linkages (Joyce, 1989, *Gene,* 82, 83-87; Beaudry *et al.,* 1992, *Science* 257, 635-641; Joyce, 1992, *Scientific American* 267, 90-97; Breaker *et al.,* 1994, *TIBTECH* 12, 268; Bartel *et al.,*1993, *Science* 261:1411-1418; Szostak, 1993, *TIBS* 17, 89-93; Kumar *et al.,* 1995, *FASEB J.,* 9, 1183; Breaker, 1996, *Curr. Op. Biotech.*, 7, 442; Santoro *et al.,* 1997, *Proc. Natl. Acad. Sci.,* 94, 4262; Tang *et al.,* 1997, *RNA* 3, 914; Nakamaye & Eckstein, 1994, *supra*; Long & Uhlenbeck, 1994, supra; Ishizaka et al., 1995, *supra*; Vaish *et al.,* 1997, *Biochemistry* 36, 6495; all of these are incorporated by reference herein). Each can catalyze a series of reactions including the hydrolysis of phosphodiester bonds in *trans* (and thus can cleave other RNA molecules) under physiological conditions.

In general, enzymatic nucleic acids act by first binding to a target RNA. Such binding occurs through the target binding portion of an enzymatic nucleic acid which is held in close proximity to an enzymatic portion of the molecule that acts to cleave the target RNA. Thus, the enzymatic nucleic acid first recognizes and then binds a target

RNA through complementary base-pairing, and once bound to the correct site, acts enzymatically to cut the target RNA. Strategic cleavage of such a target RNA will destroy its ability to direct synthesis of an encoded protein. After an enzymatic nucleic acid has bound and cleaved its RNA target, it is released from that RNA to search for another target and can repeatedly bind and cleave new targets.

Nucleic acid molecules of this invention will block to some extent PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV protein expression and can be used to treat disease or diagnose disease associated with the levels of PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV.

The enzymatic nature of a ribozyme has significant advantages, such as the concentration of ribozyme necessary to affect a therapeutic treatment is low. This advantage reflects the ability of the ribozyme to act enzymatically. Thus, a single ribozyme molecule is able to cleave many molecules of target RNA. In addition, the ribozyme is a highly specific inhibitor, with the specificity of inhibition depending not only on the base-pairing mechanism of binding to the target RNA, but also on the mechanism of target RNA cleavage. Single mismatches, or base-substitutions, near the site of cleavage can be chosen to completely eliminate catalytic activity of a ribozyme.

Nucleic acid molecules having an endonuclease enzymatic activity are able to repeatedly cleave other separate RNA molecules in a nucleotide base sequence-specific manner. Such enzymatic nucleic acid molecules can be targeted to virtually any RNA transcript, and achieve efficient cleavage *in vitro* (Zaug *et al.*, 324, *Nature,* 429 1986 ; Uhlenbeck, 1987 *Nature,* 328, 596; Kim et al., 84 *Proc. Natl. Acad. Sci. USA,* 8788, 1987; Dreyfus, 1988, *Einstein Quart. J. Bio. Med.*, 6, 92; Haseloff and Gerlach, 334 *Nature,* 585, 1988; Cech, 260 *JAMA,* 3030, 1988; Jefferies et al., 17 *Nucleic Acids Research,* 1371, 1989; and Santoro *et al.*, 1997 *supra*).

Because of their sequence specificity, *trans*-cleaving ribozymes show promise as therapeutic agents for human disease (Usman & McSwiggen, 1995 *Ann. Rep. Med. Chem.* 30, 285-294; Christoffersen and Marr, 1995 *J. Med. Chem.* 38, 2023-2037). Ribozymes can be designed to cleave specific RNA targets within the background of cellular RNA. Such a cleavage event renders the RNA non-functional and abrogates protein expression from that RNA. In this manner, synthesis of a protein associated with a disease state can be selectively inhibited (Warashina *et al.*, 1999, *Chemistry and Biology,* 6, 237-250.

The nucleic acid molecules of the instant invention are also referred to as GeneBloc™ reagents, which are essentially nucleic acid molecules (e.g.; ribozymes, antisense) capable of down-regulating gene expression.

Target sites

Targets for useful ribozymes and antisense nucleic acids can be determined as disclosed in Draper *et al.,* WO 93/23569; Sullivan *et al.,* WO 93/23057; Thompson *et al.,* WO 94/02595; Draper *et al.,* WO 95/04818; McSwiggen *et al.,* US Patent No. 5,525,468, and all hereby incorporated in their entireties by reference herein. Other examples include the following PCT applications, which concern inactivation of expression of disease-related genes: WO 95/23225, WO 95/13380, WO 94/02595, all incorporated by reference herein. Rather than repeat the guidance provided in those documents here, below are provided specific examples of such methods, not limiting to those in the art. Ribozymes and antisense to such targets are designed as described in those applications and synthesized to be tested *in vitro* and *in vivo*, as also described. The sequence of human PTP-1B, MetAP-2, BACE, ps-1, ps-2, HER2, PLN, TERT, and/or HBV RNAs (for example, GenBank accession Nos. (PTP-1B,. NM_002827), (MetAP-2, U29607), (BACE, AF190725), (ps-1, L76517), (ps-2, L43964), (HER2/c-erb2/neu, X03363), (PLN, NM_002667), (TERT, NM_003219) and (HBV, AF100308.1, HBV strain 2-18; additionally, other HBV strains can be screened by one skilled in the art, see **Table 35** for other possible strains) were screened for optimal enzymatic nucleic acid and antisense target sites using a computer-folding algorithm. Antisense, hammerhead, DNAzyme, NCH (Inozyme), amberzyme, zinzyme or G-Cleaver ribozyme binding/cleavage sites were identified. These sites are shown in **Tables 3-29, 31, 33, 34, 37-43, 56, 58, 59, 62, 63** (all sequences are 5' to 3' in the tables; X can be any base-paired sequence, the actual sequence is not relevant here). The nucleotide base position is noted in the Tables as that site to be cleaved by the designated type of enzymatic nucleic acid molecule. **Table 36** shows substrate positions selected from Renbo *et al.,* 1987, *Sci. Sin.,* 30, 507, used in Draper, US patent No. 6,017,756 entitled "METHOD AND REAGENT FOR INHIBITING HEPATITIS B VIRUS REPLICATION" and Draper et al., International PCT publication No. WO 93/23569, filed April 29, 1993, entitled "METHOD AND REAGENT FOR INHIBITING VIRAL REPLICATION". While human sequences can be

screened and enzymatic nucleic acid molecule and/or antisense thereafter designed, as discussed in Stinchcomb *et al.,* WO 95/23225, mouse targeted ribozymes may be useful to test efficacy of action of the enzymatic nucleic acid molecule and/or antisense prior to testing in humans.

Antisense, hammerhead, DNAzyme, NCH (Inozyme), amberzyme, zinzyme or G-Cleaver ribozyme binding/cleavage sites were identified, as discussed above. The nucleic acid molecules were individually analyzed by computer folding (Jaeger *et al.,* 1989 *Proc. Natl. Acad. Sci. USA*, 86, 7706) to assess whether the sequences fold into the appropriate secondary structure. Those nucleic acid molecules with unfavorable intramolecular interactions such as between the binding arms and the catalytic core were eliminated from consideration. Varying binding arm lengths can be chosen to optimize activity.

Antisense, hammerhead, DNAzyme, NCH, amberzyme, zinzyme or G-Cleaver ribozyme binding/cleavage sites were identified and were designed to anneal to various sites in the RNA target. The binding arms are complementary to the target site sequences described above. The nucleic acid molecules were chemically synthesized. The method of synthesis used follows the procedure for normal DNA/RNA synthesis as described below and in Usman *et al.,* 1987 *J. Am. Chem. Soc.*, 109, 7845; Scaringe *et al.,* 1990 *Nucleic Acids Res.*, 18, 5433; Wincott *et al.,* 1995 *Nucleic Acids Res.* 23, 2677-2684; and Caruthers *et al.*, 1992, *Methods in Enzymology* 211,3-19.

<u>Synthesis of Nucleic acid Molecules</u>

Synthesis of nucleic acids greater than 100 nucleotides in length is difficult using automated methods, and the therapeutic cost of such molecules is prohibitive. In this invention, small nucleic acid motifs ("small refers to nucleic acid motifs no more than 100 nucleotides in length, preferably no more than 80 nucleotides in length, and most preferably no more than 50 nucleotides in length; *e.g.*, antisense oligonucleotides, hammerhead or the NCH ribozymes) are preferably used for exogenous delivery. The simple structure of these molecules increases the ability of the nucleic acid to invade targeted regions of RNA structure. Exemplary molecules of the instant invention are chemically synthesized, and others can similarly be synthesized.

Oligonucleotides (e.g.; antisense GeneBlocs) are synthesized using protocols known in the art as described in Caruthers *et al.*, 1992, *Methods in Enzymology* 211, 3-19, Thompson *et al.*, International PCT Publication No. WO 99/54459, Wincott *et al.*, 1995, *Nucleic Acids Res.* 23, 2677-2684, Wincott *et al.*, 1997, *Methods Mol. Bio.*, 74, 59, Brennan *et al.*, 1998, *Biotechnol Bioeng.*, 61, 33-45, and Brennan, US patent No. 6,001,311. All of these references are incorporated herein by reference. The synthesis of oligonucleotides makes use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. In a non-limiting example, small scale syntheses are conducted on a 394 Applied Biosystems, Inc. synthesizer using a 0.2 μmol scale protocol with a 2.5 min coupling step for 2'-O-methylated nucleotides and a 45 sec coupling step for 2'-deoxy nucleotides. **Table II** outlines the amounts and the contact times of the reagents used in the synthesis cycle. Alternatively, syntheses at the 0.2 μmol scale can be performed on a 96-well plate synthesizer, such as the instrument produced by Protogene (Palo Alto, CA) with minimal modification to the cycle. A 33-fold excess (60 μL of 0.11 M = 6.6 μmol) of 2'-O-methyl phosphoramidite and a 105-fold excess of S-ethyl tetrazole (60 μL of 0.25 M = 15 μmol) can be used in each coupling cycle of 2'-O-methyl residues relative to polymer-bound 5'-hydroxyl. A 22-fold excess (40 μL of 0.11 M = 4.4 μmol) of deoxy phosphoramidite and a 70-fold excess of S-ethyl tetrazole (40 μL of 0.25 M = 10 μmol) can be used in each coupling cycle of deoxy residues relative to polymer-bound 5'-hydroxyl. Average coupling yields on the 394 Applied Biosystems, Inc. synthesizer, determined by colorimetric quantitation of the trityl fractions, are typically 97.5-99%. Other oligonucleotide synthesis reagents for the 394 Applied Biosystems, Inc. synthesizer include the following: detritylation solution is 3% TCA in methylene chloride (ABI); capping is performed with 16% *N*-methyl imidazole in THF (ABI) and 10% acetic anhydride/10% 2,6-lutidine in THF (ABI); and oxidation solution is 16.9 mM I_2, 49 mM pyridine, 9% water in THF (PERSEPTIVE™). Burdick & Jackson Synthesis Grade acetonitrile is used directly from the reagent bottle. S-Ethyltetrazole solution (0.25 M in acetonitrile) is made up from the solid obtained from American International Chemical, Inc. Alternately, for the introduction of phosphorothioate linkages, Beaucage reagent (3H-1,2-Benzodithiol-3-one 1,1-dioxide, 0.05 M in acetonitrile) is used.

Deprotection of the antisense oligonucleotides is performed as follows: the polymer-bound trityl-on oligoribonucleotide is transferred to a 4 mL glass screw top vial and suspended in a solution of 40% aq. methylamine (1 mL) at 65 °C for 10 min. After cooling to –20 °C, the supernatant is removed from the polymer support. The support is washed three times with 1.0 mL of EtOH:MeCN:H2O/3:1:1, vortexed and the supernatant is then added to the first supernatant. The combined supernatants, containing the oligoribonucleotide, are dried to a white powder.

The method of synthesis used for normal RNA including certain enzymatic nucleic acid molecules follows the procedure as described in Usman *et al.*, 1987, *J. Am. Chem. Soc.*, 109, 7845; Scaringe *et al.*, 1990, *Nucleic Acids Res.*, 18, 5433; and Wincott *et al.*, 1995, *Nucleic Acids Res.* 23, 2677-2684 Wincott *et al.*, 1997, *Methods Mol. Bio.*, 74, 59, and makes use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. In a non-limiting example, small scale syntheses are conducted on a 394 Applied Biosystems, Inc. synthesizer using a 0.2 µmol scale protocol with a 7.5 min coupling step for alkylsilyl protected nucleotides and a 2.5 min coupling step for 2'-O-methylated nucleotides. **Table II** outlines the amounts and the contact times of the reagents used in the synthesis cycle. Alternatively, syntheses at the 0.2 µmol scale can be done on a 96-well plate synthesizer, such as the instrument produced by Protogene (Palo Alto, CA) with minimal modification to the cycle. A 33-fold excess (60 µL of 0.11 M = 6.6 µmol) of 2'-O-methyl phosphoramidite and a 75-fold excess of S-ethyl tetrazole (60 µL of 0.25 M = 15 µmol) can be used in each coupling cycle of 2'-O-methyl residues relative to polymer-bound 5'-hydroxyl. A 66-fold excess (120 µL of 0.11 M = 13.2 µmol) of alkylsilyl (ribo) protected phosphoramidite and a 150-fold excess of S-ethyl tetrazole (120 µL of 0.25 M = 30 µmol) can be used in each coupling cycle of ribo residues relative to polymer-bound 5'-hydroxyl. Average coupling yields on the 394 Applied Biosystems, Inc. synthesizer, determined by colorimetric quantitation of the trityl fractions, are typically 97.5-99%. Other oligonucleotide synthesis reagents for the 394 Applied Biosystems, Inc. synthesizer include the following: detritylation solution is 3% TCA in methylene chloride (ABI); capping is performed with 16% *N*-methyl imidazole in THF (ABI) and 10% acetic anhydride/10% 2,6-lutidine in THF (ABI); oxidation solution is 16.9 mM I_2, 49 mM pyridine, 9% water in THF (PERSEPTIVE™). Burdick & Jackson Synthesis Grade

acetonitrile is used directly from the reagent bottle. S-Ethyltetrazole solution (0.25 M in acetonitrile) is made up from the solid obtained from American International Chemical, Inc. Alternately, for the introduction of phosphorothioate linkages, Beaucage reagent (3H-1,2-Benzodithiol-3-one 1,1-dioxide0.05 M in acetonitrile) is used.

Deprotection of the RNA is performed using either a two-pot or one-pot protocol. For the two-pot protocol, the polymer-bound trityl-on oligoribonucleotide is transferred to a 4 mL glass screw top vial and suspended in a solution of 40% aq. methylamine (1 mL) at 65 °C for 10 min. After cooling to –20 °C, the supernatant is removed from the polymer support. The support is washed three times with 1.0 mL of EtOH:MeCN:H2O/3:1:1, vortexed and the supernatant is then added to the first supernatant. The combined supernatants, containing the oligoribonucleotide, are dried to a white powder. The base deprotected oligoribonucleotide is resuspended in anhydrous TEA/HF/NMP solution (300 μL of a solution of 1.5 mL N-methylpyrrolidinone, 750 μL TEA and 1 mL TEA•3HF to provide a 1.4 M HF concentration) and heated to 65 °C. After 1.5 h, the oligomer is quenched with 1.5 M NH_4HCO_3.

Alternatively, for the one-pot protocol, the polymer-bound trityl-on oligoribonucleotide is transferred to a 4 mL glass screw top vial and suspended in a solution of 33% ethanolic methylamine/DMSO: 1/1 (0.8 mL) at 65 °C for 15 min. The vial is brought to r.t. TEA•3HF (0.1 mL) is added and the vial is heated at 65 °C for 15 min. The sample is cooled at –20 °C and then quenched with 1.5 M NH_4HCO_3.

For purification of the trityl-on oligomers, the quenched NH_4HCO_3 solution is loaded onto a C-18 containing cartridge that had been prewashed with acetonitrile followed by 50 mM TEAA. After washing the loaded cartridge with water, the RNA is detritylated with 0.5% TFA for 13 min. The cartridge is then washed again with water, salt exchanged with 1 M NaCl and washed with water again. The oligonucleotide is then eluted with 30% acetonitrile.

Inactive hammerhead ribozymes or binding attenuated control (BAC) oligonucleotides) are synthesized by substituting a U for G_5 and a U for A_{14} (numbering from Hertel, K. J., *et al.*, 1992, Nucleic Acids Res., 20, 3252). Similarly, one or more nucleotide substitutions can be introduced in other enzymatic nucleic acid molecules to inactivate the molecule and such molecules can serve as a negative control.

The average stepwise coupling yields are typically >98% (Wincott *et al.*, 1995 *Nucleic Acids Res.* 23, 2677-2684). Those of ordinary skill in the art will recognize that the scale of synthesis can be adapted to be larger or smaller than the example described above including but not limited to 96-well format, all that is important is the ratio of chemicals used in the reaction.

Alternatively, the nucleic acid molecules of the present invention can be synthesized separately and joined together post-synthetically, for example, by ligation (Moore *et al.*, 1992, *Science* 256, 9923; Draper *et al.*, International PCT publication No. WO 93/23569; Shabarova *et al.*, 1991, *Nucleic Acids Research* 19, 4247; Bellon *et al.*, 1997, *Nucleosides & Nucleotides*, 16, 951; Bellon *et al.*, 1997, *Bioconjugate Chem.* 8, 204).

The nucleic acid molecules of the present invention are modified extensively to enhance stability by modification with nuclease resistant groups, for example, 2'-amino, 2'-*C*-allyl, 2'-flouro, 2'-*O*-methyl, 2'-H (for a review see Usman and Cedergren, 1992, *TIBS* 17, 34; Usman *et al.*, 1994, *Nucleic Acids Symp. Ser.* 31, 163). Ribozymes are purified by gel electrophoresis using general methods or are purified by high pressure liquid chromatography (HPLC; see Wincott *et al.*, *supra*, the totality of which is hereby incorporated herein by reference) and are re-suspended in water.

The sequences of the ribozymes and antisense constructs that are chemically synthesized, useful in this study, are shown in **Tables 3-31, 33, 34, 37-43, 56, 58, 59, 62, 63**. Those in the art will recognize that these sequences are representative only of many more such sequences where the enzymatic portion of the ribozyme (all but the binding arms) is altered to affect activity. The ribozyme and antisense construct sequences listed in **Tables 3-31, 33, 34, 37-43, 56, 58, 59, 62, 63** may be formed of ribonucleotides or other nucleotides or non-nucleotides. Such ribozymes with enzymatic activity are equivalent to the ribozymes described specifically in the Tables.

Optimizing Activity of the nucleic acid molecule of the invention.

Chemically synthesizing nucleic acid molecules with modifications (base, sugar and/or phosphate) that prevent their degradation by serum ribonucleases may increase their potency (see *e.g.*, Eckstein *et al.*, International Publication No. WO 92/07065; Perrault *et al.*, 1990 *Nature* 344, 565; Pieken et al., 1991, *Science* 253, 314; Usman and Cedergren, 1992, *Trends in Biochem. Sci.* 17, 334; Usman *et al.*, International Publication No. WO 93/15187; Rossi *et al.*, International Publication No. WO 91/03162; Sproat, US Patent No.

5,334,711; and Burgin *et al., supra;* all of these describe various chemical modifications that can be made to the base, phosphate and/or sugar moieties of the nucleic acid molecules herein and are all hereby incorporated by reference herein). Modifications which enhance their efficacy in cells, and removal of bases from nucleic acid molecules to shorten oligonucleotide synthesis times and reduce chemical requirements are desired.

There are several examples in the art describing sugar, base and phosphate modifications that can be introduced into nucleic acid molecules (e.g., enzymatic nucleic acid molecules) without significantly effecting catalysis and with significant enhancement in their nuclease stability and efficacy. Enzymatic nucleic acid molecules are modified to enhance stability and/or enhance catalytic activity by modification with nuclease resistant groups, for example, 2'-amino, 2'-*C*-allyl, 2'-fluoro, 2'-*O*-methyl, 2'-*O*-allyl, 2'-H, nucleotide base modifications (for a review see Usman and Cedergren, 1992 *TIBS* 17, 34; Usman *et al.,* 1994 *Nucleic Acids Symp. Ser.* 31, 163; Burgin *et al.,* 1996 *Biochemistry* 35, 14090). Sugar modification of enzymatic nucleic acid molecules have been extensively described in the art (see Eckstein *et al., International Publication* PCT No. WO 92/07065; Perrault *et al. Nature* 1990, *344*, 565-568; Pieken *et al. Science* 1991, *253*, 314-317; Usman and Cedergren, *Trends in Biochem. Sci.* 1992, *17*, 334-339; Usman *et al. International Publication* PCT No. WO 93/15187; Sproat, *US Patent* No. 5,334,711 and Beigelman *et al.,* 1995 *J. Biol. Chem.* 270, 25702; all of the references are hereby incorporated in their totality by reference herein). Such publications describe general methods and strategies to determine the location of incorporation of sugar, base and/or phosphate modifications and the like into enzymatic nucleic acid molecules without inhibiting catalysis, and are incorporated by reference herein. The 2'-position of the sugar in a nucleotide present in the nucleic acid molecules of the instant invention which tolerates substitution is selected from the group comprising -H, -OH, -COOH, $-CONH_2$, $-CONHR^1$, $-CONR^1R^2$, $-NH_2$, $-NHR^1$, $-NR^1R^2$, $-NHCOR^1$, -SH, SR^1, -F, $-ONH_2$, $-ONHR^1$, $-ONR^1R^2$, -NHOH, $-NHOR^1$, $-NR^2OH$, $-NR^2OR^1$, substituted or unsubstituted C_1-C_{10} straight chain or branched alkyl, substituted or unsubstituted C_2-C_{10} straight chain or branched alkenyl, substituted or unsubstituted C_2-C_{10} straight chain or branched alkynyl, substituted or unsubstituted C_1-C_{10} straight chain or branched alkoxy, substituted or unsubstituted C_2-C_{10} straight chain or branched alkenyloxy, and substituted or unsubstituted C_2-C_{10} straight chain or branched alkynyloxy. The substituents for sugar 2'

position preferably are independently halogen, cyano, amino, carboxy, ester, ether, carboxamide, hydroxy, or mercapto. R^1 and R^2 can be substituted or unsubstituted alkyl, alkenyl, or alkynyl groups, where the substituents are independently halogen, cyano, amino, carboxy, ester, ether, carboxamide, hydroxy, or mercapto.

In view of such teachings, similar modifications can be used as described herein to modify the nucleic acid molecules of the instant invention. Such publications describe general methods and strategies to determine the location of incorporation of sugar, base and/or phosphate modifications and the like into ribozymes without inhibiting catalysis, and are incorporated by reference herein. In view of such teachings, similar modifications can be used as described herein to modify the nucleic acid molecules of the instant invention.

Some of the non-limiting examples of base modifications that can be introduced into enzymatic nucleic acids without significantly effecting their catalytic activity include, inosine, purine, pyridin-4-one, pyridin-2-one, phenyl, pseudouracil, 2, 4, 6-trimethoxy benzene, 3-methyluracil, dihydrouridine, naphthyl, aminophenyl, 5-alkylcytidines (*e.g.*, 5-methylcytidine), 5-alkyluridines (*e.g.*, ribothymidine), 5-halouridine (*e.g.*, 5-bromouridine) or 6-azapyrimidines or 6-alkylpyrimidines (*e.g.* 6-methyluridine) and others (Burgin *et al.*, 1996, *Biochemistry*, 35, 14090). By "modified bases" in this aspect is meant nucleotide bases other than adenine, guanine, cytosine and uracil at 1' position or their equivalents; such bases may be used within the catalytic core of the enzyme and/or in the substrate-binding regions.

The nucleic acid bases can be hypoxanthin-9-yl, or a functional equivalent thereof, in position[15.1] of the ribozyme; the base at other positions may be guanin-9-yl, hypoxanthin-9-yl or 7-deazaguanin-9-yl in positions 5, 8 and 12 in the ribozyme; adenin-9-yl, 2,6-diaminopurin-9-yl, purin-9-yl or 7-deaza adenin-9-yl in positions 6, 9, 13 and 14; uracil-1-yl, uracil-5-yl, thymin-1-yl or 5-propynyluracil-1-yl in position 4; cytosin-1-yl, 5-methylcytosin-1-yl or 5-propynylcytosin-1-yl in position 3; and adenin-9-yl, cytosin-1-yl, guanin-9-yl, uracil-1-yl, uracil-5-yl, hypoxanthin-9-yl, thymin-1-yl, 5-methylcytosin-1-yl, 2,6-diaminopurin-9-yl, purin-9-yl, 7-deaza adenin-9-yl, 7-deazaguanin-9-yl, 5-propynylcytosin-1-yl, 5-propynyluracil-1-yl, isoguanin-9-yl, 2-aminopurin-9-yl, 6-methyluracil-1-yl, 4-thiouracil-1-yl, 2-pyrimidone-1-yl, quinazoline-2,4-dione-1-yl, xanthin-9-yl, N^2-dimethylguanin-9-yl, or a functional equivalent thereof in position 7. The

base at position 15.1 is preferably hypoxanthin-9-yl or an analog where no hydrogen bond can form between any group at the 2 position of the base and the 2-oxo group of $C^{16.1}$. Preferably, B is not guanin-9-yl in position 15.1.

In particular, the invention features modified ribozymes having a base substitution selected from pyridin-4-one, pyridin-2-one, phenyl, pseudouracil, 2, 4, 6-trimethoxy benzene, 3-methyluracil, dihydrouracil, naphthyl, 6-methyl-uracil and aminophenyl.

While chemical modification of oligonucleotide internucleotide linkages with phosphorothioate, phosphorothioate, and/or 5'-methylphosphonate linkages improves stability, too many of these modifications may cause some toxicity. Therefore, when designing nucleic acid molecules, the amount of these internucleotide linkages should be minimized. The reduction in the concentration of these linkages should lower toxicity resulting in increased efficacy and higher specificity of these molecules.

Nucleic acid molecules having chemical modifications which maintain or enhance activity are provided. Such nucleic acid molecules are also generally more resistant to nucleases than unmodified nucleic acid. Thus, in a cell and/or *in vivo* the activity may not be significantly lowered. Therapeutic nucleic acid molecules delivered exogenously must optimally be stable within cells until translation of the target RNA has been inhibited long enough to reduce the levels of the undesirable protein. This period of time varies between hours to days depending upon the disease state. Clearly, nucleic acid molecules must be resistant to nucleases in order to function as effective intracellular therapeutic agents. Improvements in the chemical synthesis of RNA and DNA (Wincott *et al.*, 1995 *Nucleic Acids Res.* 23, 2677; Caruthers *et al.*, 1992, *Methods in Enzymology* 211,3-19 (all are incorporated by reference herein) have expanded the ability to modify nucleic acid molecules by introducing nucleotide modifications to enhance their nuclease stability as described above.

Use of these the nucleic acid-based molecules of the invention will lead to better treatment of the disease progression by affording the possibility of combination therapies (*e.g.*, multiple antisense or enzymatic nucleic acid molecules targeted to different genes, nucleic acid molecules coupled with known small molecule inhibitors, or intermittent treatment with combinations of molecules (including different motifs) and/or other chemical or biological molecules). The treatment of patients with nucleic acid molecules may also include combinations of different types of nucleic acid molecules.

Therapeutic nucleic acid molecules (*e.g.*, enzymatic nucleic acid molecules and antisense nucleic acid molecules) delivered exogenously must optimally be stable within cells until translation of the target RNA has been inhibited long enough to reduce the levels of the undesirable protein. This period of time varies between hours to days depending upon the disease state. Clearly, these nucleic acid molecules must be resistant to nucleases in order to function as effective intracellular therapeutic agents. Improvements in the chemical synthesis of nucleic acid molecules described in the instant invention and in the art have expanded the ability to modify nucleic acid molecules by introducing nucleotide modifications to enhance their nuclease stability as described above.

By "enhanced enzymatic activity" is meant to include activity measured in cells and/or *in vivo* where the activity is a reflection of both catalytic activity and ribozyme stability. In this invention, the product of these properties is increased or not significantly (less than 10-fold) decreased *in vivo* compared to an all RNA ribozyme or all DNA enzyme.

In yet another preferred embodiment, nucleic acid catalysts having chemical modifications which maintain or enhance enzymatic activity are provided. Such nucleic acid catalysts are also generally more resistant to nucleases than unmodified nucleic acid. Thus, in a cell and/or *in vivo* the activity may not be significantly lowered. As exemplified herein such ribozymes are useful in a cell and/or *in vivo* even if activity over all is reduced 10 fold (Burgin *et al.*, 1996, *Biochemistry*, 35, 14090). Such ribozymes herein are said to "maintain" the enzymatic activity of an all RNA ribozyme.

In another aspect the nucleic acid molecules comprise a 5' and/or a 3'- cap structure.

By "cap structure" is meant chemical modifications, which have been incorporated at either terminus of the oligonucleotide (see, for example, Wincott *et al.*, WO 97/26270, incorporated by reference herein). These terminal modifications protect the nucleic acid molecule from exonuclease degradation, and may help in delivery and/or localization within a cell. The cap may be present at the 5'-terminus (5'-cap) or at the 3'-terminal (3'-cap) or may be present on both termini. In non-limiting examples: the 5'-cap is selected from the group comprising inverted abasic residue (moiety); 4',5'-methylene nucleotide; 1-(beta-D-erythrofuranosyl) nucleotide, 4'-thio nucleotide; carbocyclic nucleotide; 1,5-

anhydrohexitol nucleotide; L-nucleotides; alpha-nucleotides; modified base nucleotide; phosphorodithioate linkage; *threo*-pentofuranosyl nucleotide; acyclic 3',4'-seco nucleotide; acyclic 3,4-dihydroxybutyl nucleotide; acyclic 3,5-dihydroxypentyl nucleotide, 3'-3'-inverted nucleotide moiety; 3'-3'-inverted abasic moiety; 3'-2'-inverted nucleotide moiety; 3'-2'-inverted abasic moiety; 1,4-butanediol phosphate; 3'-phosphoramidate; hexylphosphate; aminohexyl phosphate; 3'-phosphate; 3'-phosphorothioate; phosphorodithioate; or bridging or non-bridging methylphosphonate moiety (for more details, see Wincott *et al.,* International PCT publication No. WO 97/26270, incorporated by reference herein).

In yet another preferred embodiment, the 3'-cap is selected from a group comprising, 4',5'-methylene nucleotide; 1-(beta-D-erythrofuranosyl) nucleotide; 4'-thio nucleotide, carbocyclic nucleotide; 5'-amino-alkyl phosphate; 1,3-diamino-2-propyl phosphate; 3-aminopropyl phosphate; 6-aminohexyl phosphate; 1,2-aminododecyl phosphate; hydroxypropyl phosphate; 1,5-anhydrohexitol nucleotide; L-nucleotide; alpha-nucleotide; modified base nucleotide; phosphorodithioate; *threo*-pentofuranosyl nucleotide; acyclic 3',4'-seco nucleotide; 3,4-dihydroxybutyl nucleotide; 3,5-dihydroxypentyl nucleotide, 5'-5'-inverted nucleotide moiety; 5'-5'-inverted abasic moiety; 5'-phosphoramidate; 5'-phosphorothioate; 1,4-butanediol phosphate; 5'-amino; bridging and/or non-bridging 5'-phosphoramidate, phosphorothioate and/or phosphorodithioate, bridging or non bridging methylphosphonate and 5'-mercapto moieties (for more details see Beaucage and Iyer, 1993, *Tetrahedron* 49, 1925; incorporated by reference herein).

An "alkyl" group refers to a saturated aliphatic hydrocarbon, including straight-chain, branched-chain, and cyclic alkyl groups. Preferably, the alkyl group has 1 to 12 carbons. More preferably it is a lower alkyl of from 1 to 7 carbons, more preferably 1 to 4 carbons. The alkyl group may be substituted or unsubstituted. When substituted the substituted group(s) is preferably, hydroxyl, cyano, alkoxy, =O, =S, NO_2 or $N(CH_3)_2$, amino, or SH. The term also includes alkenyl groups which are unsaturated hydrocarbon groups containing at least one carbon-carbon double bond, including straight-chain, branched-chain, and cyclic groups. Preferably, the alkenyl group has 1 to 12 carbons. More preferably it is a lower alkenyl of from 1 to 7 carbons, more preferably 1 to 4 carbons. The alkenyl group may be substituted or unsubstituted. When substituted the

substituted group(s) is preferably, hydroxyl, cyano, alkoxy, =O, =S, NO_2, halogen, $N(CH_3)_2$, amino, or SH. The term "alkyl" also includes alkynyl groups which have an unsaturated hydrocarbon group containing at least one carbon-carbon triple bond, including straight-chain, branched-chain, and cyclic groups. Preferably, the alkynyl group has 1 to 12 carbons. More preferably it is a lower alkynyl of from 1 to 7 carbons, more preferably 1 to 4 carbons. The alkynyl group may be substituted or unsubstituted. When substituted the substituted group(s) is preferably, hydroxyl, cyano, alkoxy, =O, =S, NO_2 or $N(CH_3)_2$, amino or SH.

Such alkyl groups may also include aryl, alkylaryl, carbocyclic aryl, heterocyclic aryl, amide and ester groups. An "aryl" group refers to an aromatic group which has at least one ring having a conjugated pi electron system and includes carbocyclic aryl, heterocyclic aryl and biaryl groups, all of which may be optionally substituted. The preferred substituent(s) of aryl groups are halogen, trihalomethyl, hydroxyl, SH, OH, cyano, alkoxy, alkyl, alkenyl, alkynyl, and amino groups. An "alkylaryl" group refers to an alkyl group (as described above) covalently joined to an aryl group (as described above). Carbocyclic aryl groups are groups wherein the ring atoms on the aromatic ring are all carbon atoms. The carbon atoms are optionally substituted. Heterocyclic aryl groups are groups having from 1 to 3 heteroatoms as ring atoms in the aromatic ring and the remainder of the ring atoms are carbon atoms. Suitable heteroatoms include oxygen, sulfur, and nitrogen, and include furanyl, thienyl, pyridyl, pyrrolyl, N-lower alkyl pyrrolo, pyrimidyl, pyrazinyl, imidazolyl and the like, all optionally substituted. An "amide" refers to an -C(O)-NH-R, where R is either alkyl, aryl, alkylaryl or hydrogen. An "ester" refers to an -C(O)-OR', where R is either alkyl, aryl, alkylaryl or hydrogen.

By "nucleotide" as used herein is as recognized in the art to include natural bases (standard), and modified bases well known in the art. Such bases are generally located at the 1' position of a nucleotide sugar moiety. Nucleotides generally comprise a base, sugar and a phosphate group. The nucleotides can be unmodified or modified at the sugar, phosphate and/or base moiety, (also referred to interchangeably as nucleotide analogs, modified nucleotides, non-natural nucleotides, non-standard nucleotides and other; see, for example, Usman and McSwiggen, *supra*; Eckstein *et al.,* International PCT Publication No. WO 92/07065; Usman *et al.,* International PCT Publication No. WO 93/15187;

Uhlman & Peyman, *supra,* all are hereby incorporated by reference herein). There are several examples of modified nucleic acid bases known in the art as summarized by Limbach *et al.,* 1994, *Nucleic Acids Res.* 22, 2183. Some of the non-limiting examples of base modifications that can be introduced into nucleic acid molecules include, inosine, purine, pyridin-4-one, pyridin-2-one, phenyl, pseudouracil, 2, 4, 6-trimethoxy benzene, 3-methyl uracil, dihydrouridine, naphthyl, aminophenyl, 5-alkylcytidines (*e.g.*, 5-methylcytidine), 5-alkyluridines (*e.g.*, ribothymidine), 5-halouridine (*e.g.*, 5-bromouridine) or 6-azapyrimidines or 6-alkylpyrimidines (*e.g.* 6-methyluridine), propyne, and others (Burgin *et al.,* 1996, *Biochemistry*, 35, 14090; Uhlman & Peyman, *supra*).

By "modified bases" in this aspect is meant nucleotide bases other than adenine, guanine, cytosine and uracil at 1' position or their equivalents; such bases may be used at any position, for example, within the catalytic core of an enzymatic nucleic acid molecule and/or in the substrate-binding regions of the nucleic acid molecule. Such modified nucleotides include dideoxynucleotides which have pharmaceutical utility well known in the art, as well as utility in basic molecular biology methods such as sequencing.

In a preferred embodiment, the invention features modified ribozymes with phosphate backbone modifications comprising one or more phosphorothioate, phosphorodithioate, methylphosphonate, morpholino, amidate carbamate, carboxymethyl, acetamidate, polyamide, sulfonate, sulfonamide, sulfamate, formacetal, thioformacetal, and/or alkylsilyl, substitutions. For a review of oligonucleotide backbone modifications, see Hunziker and Leumann, 1995, *Nucleic Acid Analogues: Synthesis and Properties,* in *Modern Synthetic Methods,* VCH, 331-417, and Mesmaeker *et al.,* 1994, *Novel Backbone Replacements for Oligonucleotides,* in *Carbohydrate Modifications in Antisense Research,* ACS, 24-39. These references are hereby incorporated by reference herein.

By "abasic" is meant sugar moieties lacking a base or having other chemical groups in place of a base at the 1' position, (for more details, see Wincott *et al.,* International PCT publication No. WO 97/26270).

By "unmodified nucleoside" or "unmodified nucleotide" is meant one of the bases adenine, cytosine, guanine, thymine, uracil joined to the 1' carbon of β-D-ribo-furanose.

By "modified nucleoside" or "modified nucleotide" is meant any nucleotide base which contains a modification in the chemical structure of an unmodified nucleotide base, sugar and/or phosphate.

In connection with 2'-modified nucleotides as described for the present invention, by "amino" is meant 2'-NH_2 or 2'-*O*- NH_2, which may be modified or unmodified. Such modified groups are described, for example, in Eckstein et al., U.S. Patent 5,672,695 and Matulic-Adamic et al., WO 98/28317, which are both incorporated by reference in their entireties.

Various modifications to nucleic acid (*e.g.,* antisense and ribozyme) structure can be made to enhance the utility of these molecules. Such modifications will enhance shelf-life, half-life *in vitro,* stability, and ease of introduction of such oligonucleotides to the target site, *e.g.,* to enhance penetration of cellular membranes, and confer the ability to recognize and bind to targeted cells.

Use of these molecules will lead to better treatment of the disease progression by affording the possibility of combination therapies (e.g., multiple ribozymes targeted to different genes, ribozymes coupled with known small molecule inhibitors, or intermittent treatment with combinations of ribozymes (including different ribozyme motifs) and/or other chemical or biological molecules). The treatment of patients with nucleic acid molecules may also include combinations of different types of nucleic acid molecules. Therapies may be devised which include a mixture of ribozymes (including different ribozyme motifs), antisense and/or 2-5A chimera molecules to one or more targets to alleviate symptoms of a disease.

Administration of Nucleic Acid Molecules

Methods for the delivery of nucleic acid molecules are described in Akhtar *et al.,* 1992, *Trends Cell Bio.*, 2, 139; and *Delivery Strategies for Antisense Oligonucleotide Therapeutics*, ed. Akhtar, 1995 which are both incorporated herein by reference. Sullivan *et al.*, PCT WO 94/02595, further describes the general methods for delivery of enzymatic RNA molecules. These protocols may be utilized for the delivery of virtually any nucleic acid molecule. Nucleic acid molecules may be administered to cells by a variety of methods known to those familiar to the art, including, but not restricted to, encapsulation in liposomes, by iontophoresis, or by incorporation into other vehicles, such as hydrogels,

cyclodextrins, biodegradable nanocapsules, and bioadhesive microspheres. For some indications, nucleic acid molecules may be directly delivered *ex vivo* to cells or tissues with or without the aforementioned vehicles. Alternatively, the nucleic acid/vehicle combination is locally delivered by direct injection or by use of a catheter, infusion pump or stent. Many examples in the art describe CNS delivery methods of oligonucleotides by osmotic pump, (see Chun *et al.,* 1998, *Neuroscience Letters,* 257, 135-138, D'Aldin *et al.,* 1998, *Mol. Brain Research,* 55, 151-164, Dryden *et al.,* 1998, *J. Endocrinol.,* 157, 169-175, Ghirnikar *et al.,* 1998, *Neuroscience Letters,* 247, 21-24) or direct infusion (Broaddus *et al.,* 1997, *Neurosurg. Focus,* 3, article 4). Other routes of delivery include, but are not limited to oral (tablet or pill form) and/or intrathecal delivery (Gold, 1997, *Neuroscience,* 76, 1153-1158). For a comprehensive review on drug delivery strategies including broad coverage of CNS delivery, see Jain, *Drug Delivery Systems: Technologies and Commercial Opportunities,* Decision Resources, 1998. Other routes of delivery include, but are not limited to, intravascular, intramuscular, subcutaneous or joint injection, aerosol inhalation, oral (tablet or pill form), topical, systemic, ocular, intraperitoneal and/or intrathecal delivery. More detailed descriptions of nucleic acid delivery and administration are provided in Sullivan *et al.*, supra, Draper *et al.*, PCT WO93/23569; Beigelman *et al.*, PCT WO99/05094, and Klimuk *et al.*, PCT WO99/04819 all of which are incorporated by reference herein.

The molecules of the instant invention can be used as pharmaceutical agents. Pharmaceutical agents prevent, inhibit the occurrence, or treat (alleviate a symptom to some extent, preferably all of the symptoms) of a disease state in a patient.

The negatively charged polynucleotides of the invention can be administered (*e.g.*, RNA, DNA or protein) and introduced into a patient by any standard means, with or without stabilizers, buffers, and the like, to form a pharmaceutical composition. When it is desired to use a liposome delivery mechanism, standard protocols for formation of liposomes can be followed. The compositions of the present invention may also be formulated and used as tablets, capsules or elixirs for oral administration; suppositories for rectal administration; sterile solutions; suspensions for injectable administration; and the other compositions known in the art.

The present invention also includes pharmaceutically acceptable formulations of the compounds described. These formulations include salts of the above compounds, *e.g.*, acid addition salts, for example, salts of hydrochloric, hydrobromic, acetic acid, and benzene sulfonic acid.

A pharmacological composition or formulation refers to a composition or formulation in a form suitable for administration, *e.g.*, systemic administration, into a cell or patient, preferably a human. Suitable forms, in part, depend upon the use or the route of entry, for example, oral, transdermal, or by injection. Such forms should not prevent the composition or formulation from reaching a target cell (*i.e.*, a cell to which the negatively charged polymer is desired to be delivered to). For example, pharmacological compositions injected into the blood stream should be soluble. Other factors are known in the art, and include considerations such as toxicity and forms which prevent the composition or formulation from exerting its effect.

By "systemic administration" is meant *in vivo* systemic absorption or accumulation of drugs in the blood stream followed by distribution throughout the entire body. Administration routes which lead to systemic absorption include, without limitations: intravenous, subcutaneous, intraperitoneal, inhalation, oral, intrapulmonary and intramuscular. Each of these administration routes expose the desired negatively charged polymers, *e.g.*, nucleic acids, to an accessible diseased tissue. The rate of entry of a drug into the circulation has been shown to be a function of molecular weight or size. The use of a liposome or other drug carrier comprising the compounds of the instant invention can potentially localize the drug, for example, in certain tissue types, such as the tissues of the reticular endothelial system (RES). A liposome formulation which can facilitate the association of drug with the surface of cells, such as, lymphocytes and macrophages is also useful. This approach may provide enhanced delivery of the drug to target cells by taking advantage of the specificity of macrophage and lymphocyte immune recognition of abnormal cells, such as cancer cells.

By pharmaceutically acceptable formulation is meant, a composition or formulation that allows for the effective distribution of the nucleic acid molecules of the instant invention in the physical location most suitable for their desired activity. Nonlimiting examples of agents suitable for formulation with the nucleic acid molecules of the instant invention include: P-glycoprotein inhibitors (such as Pluronic P85) which can enhance

entry of drugs into the CNS (Jolliet-Riant and Tillement, 1999, *Fundam. Clin. Pharmacol.*, 13, 16-26); biodegradable polymers, such as poly (DL-lactide-coglycolide) microspheres for sustained release delivery after intracerebral implantation (Emerich, DF *et al*, 1999, *Cell Transplant*, 8, 47-58) Alkermes, Inc. Cambridge, MA; and loaded nanoparticles, such as those made of polybutylcyanoacrylate, which can deliver drugs across the blood brain barrier and can alter neuronal uptake mechanisms (*Prog Neuropsychopharmacol Biol Psychiatry*, 23, 941-949, 1999). Other non-limiting examples of delivery strategies for the nucleic acid molecules of the instant invention include material described in Boado *et al.*, 1998, *J. Pharm. Sci.*, 87, 1308-1315; Tyler *et al.*, 1999, *FEBS Lett.*, 421, 280-284; Pardridge *et al.*, 1995, *PNAS USA.*, 92, 5592-5596; Boado, 1995, *Adv. Drug Delivery Rev.*, 15, 73-107; Aldrian-Herrada *et al.*, 1998, *Nucleic Acids Res.*, 26, 4910-4916; and Tyler *et al.*, 1999, *PNAS USA.*, 96, 7053-7058.

The invention also features the use of the composition comprising surface-modified liposomes containing poly (ethylene glycol) lipids (PEG-modified, or long-circulating liposomes or stealth liposomes). These formulations offer a method for increasing the accumulation of drugs in target tissues. This class of drug carriers resists opsonization and elimination by the mononuclear phagocytic system (MPS or RES), thereby enabling longer blood circulation times and enhanced tissue exposure for the encapsulated drug (Lasic *et al. Chem. Rev.* 1995, 95, 2601-2627; Ishiwata *et al.*, *Chem. Pharm. Bull.* 1995, 43, 1005-1011). Such liposomes have been shown to accumulate selectively in tumors, presumably by extravasation and capture in the neovascularized target tissues (Lasic *et al.*, *Science* 1995, 267, 1275-1276; Oku *et al.*,1995, *Biochim. Biophys. Acta*, 1238, 86-90). The long-circulating liposomes enhance the pharmacokinetics and pharmacodynamics of DNA and RNA, particularly compared to conventional cationic liposomes which are known to accumulate in tissues of the MPS (Liu *et al.*, *J. Biol. Chem.* 1995, 42, 24864-24870; Choi *et al.*, International PCT Publication No. WO 96/10391; Ansell *et al.*, International PCT Publication No. WO 96/10390; Holland *et al.*, International PCT Publication No. WO 96/10392; all of which are incorporated herein by reference). Long-circulating liposomes are also likely to protect drugs from nuclease degradation to a greater extent compared to cationic liposomes, based on their ability to avoid accumulation in metabolically aggressive MPS tissues such as the liver and spleen.

The present invention also includes compositions prepared for storage or administration which include a pharmaceutically effective amount of the desired compounds in a pharmaceutically acceptable carrier or diluent. Acceptable carriers or diluents for therapeutic use are well known in the pharmaceutical art, and are described, for example, in *Remington's Pharmaceutical Sciences*, Mack Publishing Co. (A.R. Gennaro edit. 1985) hereby incorporated by reference herein. For example, preservatives, stabilizers, dyes and flavoring agents may be provided. These include sodium benzoate, sorbic acid and esters of *p*-hydroxybenzoic acid. In addition, antioxidants and suspending agents may be used.

A pharmaceutically effective dose is that dose required to prevent, inhibit the occurrence, or treat (alleviate a symptom to some extent, preferably all of the symptoms) of a disease state. The pharmaceutically effective dose depends on the type of disease, the composition used, the route of administration, the type of mammal being treated, the physical characteristics of the specific mammal under consideration, concurrent medication, and other factors which those skilled in the medical arts will recognize. Generally, an amount between 0.1 mg/kg and 100 mg/kg body weight/day of active ingredients is administered dependent upon potency of the negatively charged polymer.

The nucleic acid molecules of the present invention may also be administered to a patient in combination with other therapeutic compounds to increase the overall therapeutic effect. The use of multiple compounds to treat an indication may increase the beneficial effects while reducing the presence of side effects.

Alternatively, certain of the nucleic acid molecules of the instant invention can be expressed within cells from eukaryotic promoters (*e.g.*, Izant and Weintraub, 1985, *Science*, 229, 345; McGarry and Lindquist, 1986, *Proc. Natl. Acad. Sci.*, USA 83, 399; Scanlon *et al.*, 1991, *Proc. Natl. Acad. Sci. USA*, 88, 10591-5; Kashani-Sabet *et al.*, 1992, *Antisense Res. Dev.*, 2, 3-15; Dropulic *et al.*, 1992, *J. Virol.*, 66, 1432-41; Weerasinghe *et al.*, 1991, *J. Virol.*, 65, 5531-4; Ojwang *et al.*, 1992, *Proc. Natl. Acad. Sci. USA*, 89, 10802-6; Chen *et al.*, 1992, *Nucleic Acids Res.*, 20, 4581-9; Sarver *et al.*, 1990 *Science*, 247, 1222-1225; Thompson *et al.*, 1995, *Nucleic Acids Res.*, 23, 2259; Good *et al.*, 1997, *Gene* Therapy, 4, 45; all of these references are hereby incorporated herein, in their totalities, by reference). Those skilled in the art realize that any nucleic acid can be expressed in eukaryotic cells from the appropriate DNA/RNA vector. The activity of such

nucleic acids can be augmented by their release from the primary transcript by a ribozyme (Draper *et al.*, PCT WO 93/23569, and Sullivan *et al.*, PCT WO 94/02595; Ohkawa *et al.*, 1992, *Nucleic Acids Symp. Ser.*, 27, 15-6; Taira *et al.*, 1991, *Nucleic Acids Res.*, 19, 5125-30; Ventura *et al.*, 1993, *Nucleic Acids Res.*, 21, 3249-55; Chowrira *et al.*, 1994, *J. Biol. Chem.*, 269, 25856; all of these references are hereby incorporated in their totality by reference herein).

In another aspect of the invention, RNA molecules of the present invention are preferably expressed from transcription units (see, for example, Couture *et al.*, 1996, *TIG.*, 12, 510) inserted into DNA or RNA vectors. The recombinant vectors are preferably DNA plasmids or viral vectors. Ribozyme expressing viral vectors could be constructed based on, but not limited to, adeno-associated virus, retrovirus, adenovirus, or alphavirus. Preferably, the recombinant vectors capable of expressing the nucleic acid molecules are delivered as described above, and persist in target cells. Alternatively, viral vectors may be used that provide for transient expression of nucleic acid molecules. Such vectors might be repeatedly administered as necessary. Once expressed, the nucleic acid molecule binds to the target mRNA. Delivery of nucleic acid molecule expressing vectors could be systemic, such as by intravenous or intra-muscular administration, by administration to target cells ex-planted from the patient followed by reintroduction into the patient, or by any other means that would allow for introduction into the desired target cell (for a review see Couture *et al.*, 1996, *TIG.*, 12, 510).

In one aspect, the invention features an expression vector comprising a nucleic acid sequence encoding at least one of the nucleic acid molecules of the instant invention is disclosed. The nucleic acid sequence encoding the nucleic acid molecule of the instant invention is operably linked in a manner which allows expression of that nucleic acid molecule.

In another aspect the invention features an expression vector comprising: a) a transcription initiation region (*e.g.*, eukaryotic pol I, II or III initiation region); b) a transcription termination region (*e.g.*, eukaryotic pol I, II or III termination region); c) a nucleic acid sequence encoding at least one of the nucleic acid catalyst of the instant invention; and wherein said sequence is operably linked to said initiation region and said termination region, in a manner which allows expression and/or delivery of said nucleic acid molecule. The vector may optionally include an open reading frame (ORF) for a

protein operably linked on the 5' side or the 3'-side of the sequence encoding the nucleic acid catalyst of the invention; and/or an intron (intervening sequences).

Transcription of the nucleic acid molecule sequences are driven from a promoter for eukaryotic RNA polymerase I (pol I), RNA polymerase II (pol II), or RNA polymerase III (pol III). Transcripts from pol II or pol III promoters will be expressed at high levels in all cells; the levels of a given pol II promoter in a given cell type will depend on the nature of the gene regulatory sequences (enhancers, silencers, etc.) present nearby. Prokaryotic RNA polymerase promoters are also used, providing that the prokaryotic RNA polymerase enzyme is expressed in the appropriate cells (Elroy-Stein and Moss, 1990, *Proc. Natl. Acad. Sci. U S A*, 87, 6743-7; Gao and Huang 1993, *Nucleic Acids Res.*, 21, 2867-72; Lieber et al., 1993, *Methods Enzymol.*, 217, 47-66; Zhou et al., 1990, *Mol. Cell. Biol.*, 10, 4529-37). All of these references are incorporated by reference herein. Several investigators have demonstrated that nucleic acid molecules, such as ribozymes expressed from such promoters can function in mammalian cells (e.g. Kashani-Sabet et al., 1992, *Antisense Res. Dev.*, 2, 3-15; Ojwang et al., 1992, *Proc. Natl. Acad. Sci. U S A*, 89, 10802-6; Chen *et al.*, 1992, *Nucleic Acids Res.*, 20, 4581-9; Yu et al., 1993, *Proc. Natl. Acad. Sci. U S A*, 90, 6340-4; L'Huillier *et al.*, 1992, *EMBO J.*, 11, 4411-8; Lisziewicz *et al.*, 1993, *Proc. Natl. Acad. Sci. U. S. A*, 90, 8000-4; Thompson *et al.*, 1995, *Nucleic Acids Res.*, 23, 2259; Sullenger & Cech, 1993, *Science*, 262, 1566). More specifically, transcription units such as the ones derived from genes encoding U6 small nuclear (snRNA), transfer RNA (tRNA) and adenovirus VA RNA are useful in generating high concentrations of desired RNA molecules such as ribozymes in cells (Thompson *et al.*, *supra*; Couture and Stinchcomb, *1996, supra*; Noonberg *et al.*, 1994, *Nucleic Acid Res.*, 22, 2830; Noonberg *et al.*, US Patent No. 5,624,803; Good *et al.*, 1997, *Gene Ther.*, 4, 45; Beigelman *et al.*, International PCT Publication No. *WO 96/18736*; all of these publications are incorporated by reference herein. The above ribozyme transcription units can be incorporated into a variety of vectors for introduction into mammalian cells, including but not restricted to, plasmid DNA vectors, viral DNA vectors (such as adenovirus or adeno-associated virus vectors), or viral RNA vectors (such as retroviral or alphavirus vectors) (for a review see Couture and Stinchcomb, *1996, supra)*.

In yet another aspect, the invention features an expression vector comprising nucleic acid sequence encoding at least one of the nucleic acid molecules of the invention, in a manner which allows expression of that nucleic acid molecule. The expression vector comprises in one embodiment; a) a transcription initiation region; b) a transcription termination region; c) a nucleic acid sequence encoding at least one said nucleic acid molecule; and wherein said sequence is operably linked to said initiation region and said termination region, in a manner which allows expression and/or delivery of said nucleic acid molecule. In another preferred embodiment the expression vector comprises: a) a transcription initiation region; b) a transcription termination region; c) an open reading frame; d) a nucleic acid sequence encoding at least one said nucleic acid molecule, wherein said sequence is operably linked to the 3'-end of said open reading frame; and wherein said sequence is operably linked to said initiation region, said open reading frame and said termination region, in a manner which allows expression and/or delivery of said nucleic acid molecule. In yet another embodiment, the expression vector comprises: a) a transcription initiation region; b) a transcription termination region; c) an intron; d) a nucleic acid sequence encoding at least one said nucleic acid molecule; and wherein said sequence is operably linked to said initiation region, said intron and said termination region, in a manner which allows expression and/or delivery of said nucleic acid molecule. In another embodiment, the expression vector comprises: a) a transcription initiation region; b) a transcription termination region; c) an intron; d) an open reading frame; e) a nucleic acid sequence encoding at least one said nucleic acid molecule, wherein said sequence is operably linked to the 3'-end of said open reading frame; and wherein said sequence is operably linked to said initiation region, said intron, said open reading frame and said termination region, in a manner which allows expression and/or delivery of said nucleic acid molecule.

Examples:

The following are non-limiting examples showing the selection, isolation, synthesis and activity of nucleic acids of the instant invention.

Example 1: Telomerase

The ribonucleoprotein enzyme telomerase consists of an RNA template subunit and one or more protein subunits including telomerase reverse transcriptase (TERT), which function together to direct the synthesis of telomeres. Telomeres exist as non-nucleosome DNA/protein complexes at the physical ends of eukaryotic chromosomes. These capping structures maintain chromosome stability and replicative potential (Zakian, V. A., 1995, Science, 270, 1601-1607). Telomere structure is characterized by tandem repeats of conserved DNA sequences rich in G-C base pairs. Additional conserved telomere elements include a terminal 3'-overhang in the G-rich strand and non-histone structural proteins that are complexed with telomeric DNA in the nucleus. (Blackburn, "E., 1990, JBC., 265, 5919-5921.). Observed shortening of telomeres coincides with the onset of cellular senescence in most somatic cell lines lacking significant levels of telomerase. This finding has had a profound impact on our views concerning the mechanisms of aging, age related disease, and cancer.

Conventional DNA polymerases are unable to fully replicate the ends of linear chromosomes (Watson, J. D., 1972, Nature, 239, 197-201). This inability stems from the 3' G-rich overhang that is a product of ribonuclease cleavage of the RNA primer used in DNA replication. The overhang prevents DNA polymerase replication since the recessed C-rich parent strand cannot be used as a template. Telomerase overcomes this limitation by extending the 3' end of the chromosome using deoxyribonucleotides as substrates and a sequence within the telomerase RNA subunit as a template. (Lingner, J., 1995, Science, 269, 1533-1534). As such, telomerase is considered a reverse transcriptase that is responsible for telomere maintenance.

Telomerase was first discovered by in *Tetrahymena thermophila* in 1985 (Greider, C. W., 1995, Cell, 43, 405-413). The RNA subunits and their respective genes were later discovered and characterized in protozoa, budding yeast, and mammals. Genetic studies of these genes confirmed the role of telomerase RNA (TR) in determining telomere sequence by mutating genes which encode the telomeric RNA (Yu, G. L., 1990, Nature, 344, 126-132), (Singer, M. S., 1994, Science, 266, 404-409), (Blasco, M. A., 1995, Science, 269, 1267-1270). These studies showed that telomerase activity parallels TR expression in protozoa, yeast and mice. However, the expression of human telomerase RNA (hTR) does not correlate well with telomerase activity in mammalian cells. Many

human tissues express hTR but are devoid of telomerase activity (Feng, J., 1995, Science, 269, 1236-1241). Knockout mice, in which the mTR gene has been deleted from germline cells, have been shown to be viable for at least six generations. Cells from later generations of these mice showed chromosomal abnormalities consistent with telomere degradation, indicating that mTR is necessary for telomere length maintenance, but is not required for embryonic development, oncogenic transformation, or tumor formation in mice (Blasco, M. A., 1997, Cell, 91, 25-34).

The first catalytically active subunit of telomerase (p123) was isolated from *Euplotes aediculatus* along with another subunit (p43) and a 66-kD RNA subunit (Linger, J., 1996, Proc. Natl. Acad. Sci., 93, 10712-10717). Subsequent studies revealed telomerase catalytic subunit homologs from fission yeast (Est2p) and human genes (TRT1). The human homolog, TRT1 encoding hTERT, expressed mRNA with a strong correlation to telomerase activity in human cells (Nakamura, T. M., 1997, Science, 277, 955-959). Reconstitution of telomerase activity with *in vitro* transcribed and translated hTERT and hTR, either co-synthesized or simply mixed, demonstrated that hTERT and hTR represent the minimal components of telomerase. Furthermore, transient expression of hTERT in normal diploid human cells restored telomerase activity, demonstrating that hTERT is the only component necessary to restore telomerase activity in normal human cells (Weinrich, S. L., 1997, Nature Genetics, 17, 498-502). The introduction of telomerase into normal human cells using hTERT expression via transfection has resulted in the extension of life span in these cells. Such findings indicate that telomere loss in the absence of telomerase is the "mitotic clock" that controls the replicative potential of a cell prior to senescence (Bodnar, A. G., 1998, Science, 279, 349-352).

Expression of telomerase is observed in germ cell and most cancer cell lines. These "immortal" cell lines continue to divide without shortening of their telomeres (Kim, N. W., 1994, Science, 266, 2011-2015). A model of tumor progression has evolved from these findings, suggesting a role for telomerase expression in malignant transformation. Successful malignant transformation in human cells was accomplished for the first time by ectopic expression of hTERT in combination with two oncogenes, SV40 large-T and H-ras. Injection of nude mice with cells expressing these oncogenes and hTERT resulted in rapid growth of tumors. These observations indicate that hTERT mediated telomere

maintenance is essential for the formation of human tumor cells (Hahn, W. C., 1999, Nature, 400, 464-468).

Various methods have been developed to assay telomerase activity *in vitro*. The most widely used method to characterize telomerase activity is the telomeric repeat amplification protocol (TRAP). TRAP utilizes RT-PCR of cellular extracts to measure telomerase activity by making the amount of PCR target dependant upon the biochemical activity of the enzyme (Kim, N. W., 1997, Nucleic Acids Research, 25, 2595-2597, which is incorporated by reference herein).

A method based on Kim is as follows. Briefly, for the telomerase assay, 2µg of protein extract is used. The extract is assayed in 50µl of reaction mixture containing 0.1 µg TS substrate primer (5'-AATCCGTCGAGCAGAGTT-3', end-labeled using alpha-^{32}P-ATP and T4 polynucleotide kinase), 0.1µg ACX return primer(5'-GCGCGG[CTTACC]$_3$ CTAACC-3'), 0.1 µg NT internal control primer (5'-ATCGCTTCTCGGCCTTTT-3'), 0.01 micromol TSNT internal control template (5'-AATCCGTCGAGCAGAGTTAAAAGGCCGAGAACGAT-3'), 50 µM each deoxynucleoside triphosphate, 2 U of Taq DNA polymerase, and 2 µl CHAPS protein extract, all in 1X TRAP buffer (20 mM Tris (pH 8.3), 68 mM KCl, 1.5 mM $MgCl_2$, 1 mM EGTA, 0.05% Tween 20). Each reaction is placed in a thermocycler block preheated to 30 C and incubated at 30 C for 10 minutes, then cycled for 27 cycles of 94 degrees C for 30 seconds, 60 degrees C for 30 seconds. Reaction products are separated on a denaturing 8% polyacrylamide gel, followed by drying of the gel and autoradiography. The internal control (to control for possible Taq polymerase inhibition) generates a band of 36 nt. Comparison of radioactive signal integrated (*e.g.*, by phorphorimager analysis) for telomerase-extended bands with the radioactive signal from a reaction performed with a known amount of quantification standard template (termed R8; 5'-AATCCGTCGAGCAGAGTTAG [GGTTAG]$_7$-3') allows expression of telomerase activity as an absolute value. The absolute value = TPG (total product generated) =[(TP-TPí)/TI]/[(R8-B)/RI)] x 100, where TP = telomerase products from test extract, TPí = telomerase products from a heat-inactivated (75 C, 10 minutes) extract reaction, TI = the signal from the internal control, R8 = the signal from the R8 qualification standard template reaction, B = signal from a lysis buffer-only blank reaction, and RI = the internal control value for the reaction containing R8 template and NT and TSNT control primers.

TPG values of 0-10,000 are possible, with the linear range being from approximately 1 to 1000 TPG. The range of 1 to 1000 TPG encompasses the minimum and maximum levels of telomerase activity in most tumor samples tested, while non-tumor cells most often have no telomerase activity (TPG approximately zero).

Telomerase activity may also be assayed as follows. Samples to be assayed for telomerase activity are prepared by extraction into CHAPS lysis buffer (10mM Tris pH 7.5, 1mM $MgCl_2$, 1mM EGTA, 0.1 mM PMSF, 5mM -mercaptoethanol, 1mM DTT, 0.5% 3-[(3-cholamidopropyl)-dimethyl-amino]-1- propanesulfonate (CHAPS), 10% glycerol and 40 U/ml RNAse inhibitor (Promega, Madison, WI, U.S.A.). Cells are suspended in CHAPS lysis buffer and incubated on ice for 30 minutes, which allows lysis of 90-100% of cells. Lysate is then transferred to polyallomer centrifuge tubes and spun at 100,000 x g for 1 hour at 4 degrees C. The supernatant is the protein extract, and concentration ranges of 4-10 μg/μl are suitable for telomerase assay. Extracts may be concentrated if necessary using a Microcon Microfilter 30 (Amicron, Beverly, MA U.S.A.) according to the manufactureris instructions. Extracts may be stored frozen at –80 degrees C until assayed.

A variety of animal models have been designed to assay telomerase activity *in vivo*. Inhibition of telomerase activity has been analyzed in rats via cell proliferation studies with MNU (N-methyl-N-nitosurea) induced mammary carcinomas in response to treatment with 4-(hydroxyphenyl)retinamide (4-HPR), a known inhibitor of mammary carcinogenesis in animal models and premenopausal women (Bednarek, A., 1999, Carcinogenesis, 20, 879-883). Additional studies have focused on the up-regulation of telomerase in transformed cell lines from animal and human model systems (Zhang, P. B., 1998, Leuk. Res., 22, 509-516), (Chadeneau, C., 1995, Oncogene, 11, 893-898), (Greenberg, R., 1999, Oncogene, 18, 1219-1226).

Human cell culture studies have been established to assay inhibition of telomerase activity in human carcinomas responding to various therapeutics. A human breast cancer model for studying telomerase inhibitors is described (Raymond, E., 1999, Br. J. Cancer, 80, 1332-1341). Human studies of telomerase expression as related to various other cancers are described including cervical cancer (Nakano, K., 1998, Am. J. Pathol, 153, 857-864), endometrial cancer (Kyo, S., 1999, Int. J. Cancer, 80, 60-63), meningeal carcinoma (Kleinschmidt-DeMasters, B. K., 1998, J. Neurol. Sci., 161, 124-134), lung

carcinoma (Yashima, K., 1997, Cancer Reseach, 57, 2372-2377), testicular cancer in response to cisplatin (Burger, A. M., 1997, Eur. J. Cancer, 33, 638-644), and ovarian carcinoma (Counter, C. M., 1994, Proc. Natl. Acad. Sci., 91, 2900-2904).

Particular degenerative and disease states that can be associated with telomerase expression modulation include but are not limited to:

Cancer: Almost all human tumors have detectable telomerase activity (Shay, J. W., 1997, Eur. J. Cancer, 33, 787-791). Treatment with telomerase inhibitors may provide effective cancer therapy with minimal side effects in normal somatic cells that lack telomerase activity. The therapeutic potential exists for the treatment of a wide variety of cancer types.

Restinosis: Telomerase inhibition in vascular smooth muscle cells may inhibit restinosis by limiting proliferation of these cells.

Infectious disease: Telomerase inhibition in infectious cell types that express telomerase activity may provide selective anti-infectious agent activity. Such treatment may prove especially effective in protozoan-based infection such as Giardia and Lesh Meniesis.

Transplant rejection: Telomerase inhibition in endothelial cell types may demonstrate selective immunnosuppressant activity. Activation of telomerase in transplant cells could benefit grafting success through increased proliferative potential.

Autoimmune disease: Telomerase modulation in various immune cells may prove beneficial in treating diseases such as multiple sclerosis, lupus, and AIDS.

Age related disease: Activation of telomerase expression in cells at or nearing senescence as a result of advanced age or premature aging could benefit conditions such as macular degeneration, skin ulceration, and rheumatoid arthritis.

The present body of knowledge in telomerase research indicates the need for methods to assay telomerase activity and for compounds that can regulate telomerase expression for research, diagnostic, trait alteration, animal health and therapeutic use.

Gemcytabine and cyclophosphamide are non-limiting examples of chemotherapeutic agents that can be combined with or used in conjunction with the nucleic acid molecules (*e.g.* ribozymes and antisense molecules) of the instant invention. Those skilled in the art will recognize that other drugs such as anti-cancer compounds and therapies can be similarly be readily combined with the nucleic acid molecules of the instant invention

(*e.g.* ribozymes and antisense molecules) and are hence within the scope of the instant invention. Such compounds and therapies are well known in the art (see for example *Cancer: Principles and Prantice of Oncology*, Volumes 1 and 2, eds Devita, V.T., Hellman, S., and Rosenberg, S.A., J.B. Lippincott Company, Philadelphia, USA; incorporated herein by reference) and include, without limitations, antifolates; fluoropyrimidines; cytarabine; purine analogs; adenosine analogs; amsacrine; topoisomerase I inhibitors; anthrapyrazoles; retinoids; antibiotics such as bleomycin, anthacyclins, mitomycin C, dactinomycin, and mithramycin; hexamethylmelamine; dacarbazine; l-asperginase; platinum analogs; alkylating agents such as nitrogen mustard, melphalan, chlorambucil, busulfan, ifosfamide, 4-hydroperoxycyclophosphamide, nitrosoureas, thiotepa; plant derived compounds such as vinca alkaloids, epipodophyllotoxins, taxol; Tomaxifen; radiation therapy; surgery; nutritional supplements; gene therapy; radiotherapy such as 3D-CRT; immunotoxin therapy such as ricin, monoclonal antibodies herceptin; and the like. For combination therapy, the nucleic acids of the invention are prepared in one of two ways. First, the agents are physically combined in a preparation of nucleic acid and chemotherapeutic agent, such as a mixture of a nucleic acid of the invention encapsulated in liposomes and ifosfamide in a solution for intravenous administration, wherein both agents are present in a therapeutically effective concentration (e.g., ifosfamide in solution to deliver 1000-1250 mg/m^2/day and liposome-associated nucleic acid of the invention in the same solution to deliver 0.1-100 mg/kg/day). Alternatively, the agents are administered separately but simultaneously in their respective effective doses (e.g., 1000-1250 mg/m^2/d ifosfamide and 0.1 to 100 mg/kg/day nucleic acid of the invention).

Gaeta *et al.,* US patents No. 5,760,062; 5,767,278; 5,770,613 have described small molecule inhibitors of human telomerase RNA (hTR) subunit.

Blasco *et al.,* 1995, Science, 269, 1267-1270 describe the synthesis and testing of antisense oligonucleotides targeted against a specific region of the mouse telomerase RNA (mTR) subunit and reported reduction in telomerase activity in mice.

Bisoffi *et al.,* 1998, Eur. J. Cancer, 34, 1242-1249 have studied the down regulation of human telomerase activity by a retrovirus vector expressing antisense RNA targeted against the hTR RNA.

Norton *et al.*, 1996, Nature Biotechnology, 14, 615-619 have reported the use of a peptide nucleic acid (PNA) molecule targeting hTR RNA to down regulate telomerase activity in human immortal breast epithelial cells.

Yokoyama *et al.*, 1998, Cancer Research, 58, 5406-5410 have reported the synthesis and testing of hammerhead ribozyme constructs targeting hTR RNA resulting in a decrease in the telomerase activity in Ishikawa cells.

Henderson, European Patent Application No. 666,313-A2 describes methods of identifying and cloning hTR gene for use in gene therapy approaches for creating aberrant telomeric sequences in transfected human tumor cells. A ribozyme based gene therapy approach to inhibit the expression of hTR gene is described as well. The intended result of such therapies involves incurred genetic instability based on non-native telomeric sequences resulting in rapid cell death of the treated cells.

West *et al.*, US patent No. 5,489,508 describe methods for determining telomere length and telomerase activity in cells. Inhibitors of hTR RNA, including oligonucleotides and/or small molecules are described.

These foregoing approaches of targeting the telomerase RNA subunit (TR) may not be very beneficial, because as demonstrated by Feng *et al.*, (Feng, J., 1995, Science, 269, 1236-1241), telomerase activity in humans does not correlate well to hTR concentration.

Collins *et al.*, International PCT publication No. WO 98/01542 describes assays for the detection of telomerase activity. Four human telomerase subunit proteins are described called p140, p105, p48 and p43. In addition, hybridization probes and primers are described as inhibitors of telomerase gene function. Antibody based inhibitors of telomerase protein subunits are described.

A more attractive approach to telomerase regulation would involve the regulation of human telomerase by modulating the expression of the protein subunits of the enzyme, preferably the reverse transcriptase (hTERT) subunit. Based of reconstitution experiments, hTERT and hTR represent the minimal components of telomerase. Since hTR expression does not correlate well with telomerase activity in human cells and since many human cells express hTR without telomerase activity, targeting hTERT may prove more beneficial than targeting hTR. hTERT is the only component necessary to restore telomerase activity in normal human cells. A study in which the three major subunits of telomerase (hTR, TP1, and hTERT were assayed in normal and malignant endometrial

tissues determined that hTERT is a rate limiting determinant of enzymatic activity of human telomerase (Kyo, S., 1999, Int. J. Cancer, 80, 60-63). Additional protein subunits that have been isolated most likely serve only a structural role in telomerase activity, but may be important in enhancing the activity of the telomerase enzyme. As such, hTERT is one of the better targets for the ectopic regulation of telomerase activity.

Cech *et al.*, International PCT publication No. WO 98/14593 describe compositions and methods related to hTERT for diagnosis, prognosis and treatment of human diseases, for altering proliferative capacity in cells and organisms, and for screening compounds and treatments with potential use as human therapeutics.

Cech *et al.*, International PCT publication No. WO 98/14592 describe nucleic acid and amino acid sequences encoding various telomerase protein subunits and motifs of *Euplotes aediculatus*, and related sequences from *Schizosaccharomyces, Saccharomyces* sequences, and human telomerase. The polypeptides comprising telomeric subunits and functional polypeptides and ribonucleoproteins that contain these subunits are described as well. Cech *et al.*, International PCT Publication No. *WO 98/14592*, mentions in general terms the the possibility of using antisense and ribozymes to down regulate the expression of human telomerase reverse transcriptase enzyme.

Identification of Potential Target Sites in Human TERT RNA

The sequence of human TERT was screened for accessible sites using a computer folding algorithm. Regions of the RNA that did not form secondary folding structures and contained potential ribozyme and/or antisense binding/cleavage sites were identified. The sequences of these cleavage sites are shown in **Tables 13-17.**

Selection of Enzymatic Nucleic Acid Cleavage Sites in Human TERT RNA

To test whether the sites predicted by the computer-based RNA folding algorithm corresponded to accessible sites in TERT RNA, 10 hammerhead ribozyme and three G-Cleaver ribozyme sites were selected for further analysis **(Table 17)**. Ribozyme target sites were chosen by analyzing sequences of Human TERT (Nakamura *et al.*, 1997 Science 277, 955-959; Genbank sequence accession number: NM_003219) and prioritizing the sites on the basis of folding. Ribozymes were designed that could bind each target and were individually analyzed by computer folding (Christoffersen *et al.*,

1994 *J. Mol. Struc. Theochem,* 311, 273; Jaeger *et al.*, 1989, *Proc. Natl. Acad. Sci. USA*, **86**, 7706) to assess whether the ribozyme sequences fold into the appropriate secondary structure. Those ribozymes with unfavorable intramolecular interactions between the binding arms and the catalytic core were eliminated from consideration. As noted below, varying binding arm lengths can be chosen to optimize activity. Generally, at least 5 bases on each arm are able to bind to, or otherwise interact with, the target RNA.

Chemical Synthesis and Purification of Ribozymes for Efficient Cleavage of TERT RNA

Ribozymes were designed to anneal to various sites in the RNA message. The binding arms are complementary to the target site sequences described above. The ribozymes were chemically synthesized. The method of synthesis used followed the procedure for normal RNA synthesis as described above and in Usman et al., (1987 J. Am. Chem. Soc., 109, 7845), Scaringe et al., (1990 Nucleic Acids Res., 18, 5433) and Wincott et al., supra, and made use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The average stepwise coupling yields were >98%.

Ribozymes were also synthesized from DNA templates using bacteriophage T7 RNA polymerase (Milligan and Uhlenbeck, 1989, Methods Enzymol. 180, 51). Ribozymes were purified by gel electrophoresis using general methods or were purified by high pressure liquid chromatography (HPLC; See Wincott et al., supra; the totality of which is hereby incorporated herein by reference) and were resuspended in water. The sequences of the chemically synthesized ribozymes used in this study are shown below in **Table 13-17.**

Ribozyme Cleavage of TERT RNA Target *in vitro*

Ribozymes targeted to the human TERT RNA are designed and synthesized as described above. These ribozymes can be tested for cleavage activity ***in vitro***, for example using the following procedure. The target sequences and the nucleotide location within the TERT RNA are given in **Tables 13-17**.

Cleavage Reactions: Full-length or partially full-length, internally-labeled target RNA for ribozyme cleavage assay is prepared by *in vitro* transcription in the presence of [a-^{32}p] CTP, passed over a G 50 Sephadex column by spin chromatography and used as

substrate RNA without further purification. Alternately, substrates are 5'-^{32}P-end labeled using T4 polynucleotide kinase enzyme. Assays are performed by pre-warming 15 μl of a 2X concentration of purified ribozyme in ribozyme cleavage buffer (50 mM Tris-HCl, pH 7.5 at 37°C, 10 mM $MgCl_2$) and the cleavage reaction was initiated by adding the 2X ribozyme mix to an equal volume (15 μl) of substrate RNA (maximum of 1-5 nM; 5 x 10^5 to 1 x 10^7 cpm) that was also pre-warmed in cleavage buffer. As an initial screen, assays are carried out for 1 hour at 37°C using a final concentration of either 40 nM or 1 mM ribozyme, *i.e.*, ribozyme excess. The reaction is quenched by the addition of an equal volume (30 μl) of 95% formamide, 20 mM EDTA, 0.05% bromophenol blue and 0.05% xylene cyanol after which the sample is heated to 95°C for 2 minutes, quick chilled and loaded onto a denaturing polyacrylamide gel. Substrate RNA and the specific RNA cleavage products generated by ribozyme cleavage are visualized on an autoradiograph of the gel. The percentage of cleavage is determined by Phosphor Imager® quantitation of bands representing the intact substrate and the cleavage products.

Example 2: PTP-1B

Protein tyrosine phosphorylation and dephosphorylation are important mechanisms in the regulation of signal transduction pathways that control the processes of cell growth, proliferation, and differentiation (Fantl, W. J., 1993, Annu. Rev. Biochem., 62, 453-481). Cooperative enzyme classes regulate protein tyrosine phosphorylation and dephosphorylation events. These broad classes of enzymes consist of the protein tyrosine kinases (PTKs) and protein tyrosine phosphatases (PTPs). PTKs and PTPs can exist as both receptor-type transmembrane proteins and as cytoplasmic protein enzymes. Receptor tyrosine kinases propagate signal transduction events via extracellular receptor-ligand interactions that result in the activation of the tyrosine kinase portion of the PTK in the cytoplasmic domain. Receptor-like transmembrane PTPs function through extracellular ligand binding that modulates dephosphorylation of intracellular phosphotyrosine proteins via cytoplasmic phosphatase domains. Cytoplasmic PTKs and PTPs exert enzymatic activity without receptor-mediated ligand interactions, however, phosphorylation can regulate the activity of these enzymes.

Protein tyrosine phosphatase 1B, a cytoplasmic PTP, was the first PTP to be isolated in homogeneous form (Tonks, N. K., 1988, J. Biol. Chem., 263, 6722-6730), characterized (Tonks, N. K., 1988, J. Biol. Chem., 263, 6731-6737), and sequenced (Charbonneau, H., 1989, Biochemistry, 86, 5252-5256). Cytoplasmic and receptor-like PTPs both share a catalytic domain characterized by eleven conserved amino acids containing cysteine and arginine residues that are critical for phosphatase activity (Streuli, M., 1990, EMBO, 9, 2399-2407). A cysteine residue at position 215 is responsible for the covalent attachment of phosphate to the enzyme (Guan, K., 1991, J. Biol. Chem., 266, 17026-17030). The crystal structure of human PTP1B defined the phosphate binding site of the enzyme as a glycine rich cleft at the surface of the molecule with cysteine 215 positioned at the base of this cleft. The location of cysteine 215 and the shape of the cleft provide specificity of PTPase activity for tyrosine residues but not for serine or threonine residues (Barford, D., 1994, Science, 263, 1397-1404).

Receptor tyrosine kinase and protein tyrosine phosphatase localization plays a key role in the regulation of phosphotyrosine mediated signal transduction. PTP-1B activity and specificity against a panel of receptor tyrosine kinases demonstrated clear differences between substrates, suggesting that cellular compartmentalization is a determinant in defining the activity and function of the enzyme (Lammers, R.,1993, J. Biol. Chem., 268, 22456-22462). Experiments have indicated that PTP-1B is localized predominantly in the endoplasmic reticulum via its 35 amino acid carboxyterminal sequence. PTP-1B is also tightly associated with microsomal membranes with its catalytic phosphatase domain oriented towards the cytoplasm (Frangioni, J. V., 1992, Cell, 68, 545-560).

PTP-1B has been identified as a negative regulator of the insulin response. PTP-1B is widely expressed in insulin sensitive tissues (Goldstein, B. J., 1993, Receptor, 3, 1-15). Isolated PTP-1B dephosphorylates the insulin receptor *in vitro* (Tonks, N. K., 1988, J. Biol. Chem., 263, 6731-6737). PTP-1B dephosphorylation of multiple phosphotyrosine residues of the insulin receptor proceeds sequentially and with specificity for the three tyrosine residues that are critical for receptor autoactivation (Ramachandran, C., 1992, Biochemistry, 31, 4232-4238). In addition to insulin receptor dephosphorylation, PTP-1B also dephosphorylates the insulin related subtrate 1 (IRS-1), a principal substrate of the insulin receptor (Lammers, R., 1993, J. Biol. Chem., 268, 22456-22462).

Microinjection of PTP1B into *Xenopus* oocytes results in the inhibition of insulin stimulated tyrosine phosphorylation of endogenous proteins, including the β-subunit of the insulin and insulin-like growth factor receptor proteins. The resulting 3 to 5 fold increase over endogenous PTPase activity also blocks the activation of an S6 peptide kinase (Cicirelli, M. F., 1990, Proc, Natl. Acad. Sci., 87, 5514-5518). Inactivation of recombinant rat PTP-1B with antibody immunoprecipitation results in the dramatic increase in insulin stimulated DNA synthesis and phosphatidylinositol 3'-kinase activity. Insulin stimulated receptor autophosphorylation and insulin receptor substrate 1 tyrosine phosphorylation are increased dramatically as well through PTP-1B inhibition (Ahmad, F., 1995, J. Biol. Chem., 270, 20503-20508).

Increased PTP-1B expression correlates with insulin resistance in hyperglycemic cultured fibroblasts. In this study, desensitized insulin receptor function was observed via impaired insulin-induced autophosphorylation of the receptor. Treatment with insulin sensitivity normalizing thiazolidine derivatives resulted in the amelioration of the hyperglycemic insulin resistance via a normalization in PTP-1B expression (Maegawa, H., 1995, J. Biol. Chem., 270, 7724-7730). A murine model of insulin resistance with a knockout of the hetrerotrimeric GTP-binding protein subunit Giα2 provides a type 2 diabetis phenotype that correlates with the increased expression of PTP-1B (Moxam, C. M., 1996, Nature, 379, 840-844).

PTP-1B interacts directly with the activated insulin receptor β-subunit. An inactive homolog of PTP-1B was used to precipitate the activated insulin receptor in both purified receptor preparations and whole-cell lysates. Phosphorylation of the insulin receptor's triple tyrosine residues in the kinase domain is necessary for PTP-1B interaction. Furthermore, insulin stimulates tyrosine phosphorylation of PTP-1B (Seely, B. L., 1996, Diabetes, 45, 1379-1385). A similar study confirmed the direct interaction of PTP-1B with the insulin receptor β-subunit as well as the required multiple phosphorylation sites within the receptor and PTP-1B (Bandyopadhyay, D., J. Biol. Chem., 272, 1639-1645).

Knockout mice lacking the PTP-1B gene (both homozygous PTP-1B$^{-/-}$ and heterozygous PTP-1B$^{+/-}$) have been used to study the specific role of PTP-1B relating to insulin action *in vivo*. The resulting PTP-1B deficient mice were healthy and, in the fed state, had lower blood glucose and circulating insulin levels that were half that of their

PTP-1B$^{+/+}$ expressing littermates. These PTP-1B deficient mice demonstrated enhanced insulin sensitivity in glucose and insulin tolerance tests. At the physiological level, the PTP-1B deficient mice showed increased phosphorylation of the insulin receptor after insulin administration. When fed a high fat diet, the PTP-1B deficient mice were resistant to weight gain and remained insulin sensitive as opposed to normal PTP-1B expressing mice, who rapidly gained weight and become insulin resistant (Elchebly, M., 1999, Science, 283, 1544-1548). As such, modulation of PTP-1B expression could be used to regulate autophosphorylation of the insulin receptor and increase insulin sensitivity *in vivo*. This modulation could prove beneficial in the treatment of insulin related disease states.

In light of the above findings, particular disease states that involve PTP-1B expression include but are not limited to:

Diabetes: Both type 1 and type 2 diabetes may be treated by modulation of PTP-1B expression. Type 2 diabetes correlates to desensitized insulin receptor function (White *et al.*, 1994). Disruption of the PTP-1B dephosphorylation of the insulin receptor *in vivo* manifests in insulin sensitivity and increased insulin receptor autophosphorylation (Elchebly *et al.,* 1999). Insulin dependant diabetes, type 1, may respond to PTP-1B modulation through increased insulin sensitivity.

Obesity: Elchebly *et al.,* 1999, demonstrated that PTP-1B deficient mice were resistant to weight gain when fed a high fat diet compared to normal PTP-1B expressing mice. This finding suggests that PTP-1B modulation may be beneficial in the treatment of obesity. Ahmad *et al.,* 1997, Metab. Clin. Exp., 46, 1140-1145, describe reduced PTPs in adipose tissue and improved insulin sensitivity in obese subjects following weight loss.

Troglitazone is a non-limiting example of a pharmaceutical agent that can be combined with or used in conjunction with the nucleic acid molecules (e.g. ribozymes and antisense molecules) of the instant invention. Those skilled in the art will recognize that other drugs such as anti-diabetes and anti-obesity compounds and therapies can be similarly be readily combined with the nucleic acid molecules of the instant invention (e.g. ribozymes and antisense molecules) are hence within the scope of the instant invention.

Methods have been developed to assay PTP-1B activity.

Maegawa *et al.,* 1995, J. Biol. Chem., 270, 7724-7730, describe a tissue culture model in which Rat 1 fibroblasts expressing human insulin receptors can be used to model

hyperglycemia induced insulin resistance. Maegawa *et al.* also describe assays to measure PTPase activity using labeled phosphorylated insulin receptors and by immunoenzymatic techniques.

Moxham *et al.*, 1996, Nature, 379, 840-844, describe a murine animal and tissue culture model employing Giα2 deficiency to study hyperinsulinaemia, impaired glucose tolerance and resistance to insulin *in vivo*. Assays for PTPase activity and tyrosine phosphorylation of insulin-receptor substrate 1 are described.

Khandelwal *et al.*, 1995, Molecular and Cellular Biochemistry, 153, 87-94, describe four different animal models for studying insulin dependent and insulin resistant diabetes mellitus. These models were used to study the effect of vanadate, an insulin mimetic and PTPase inhibitor, on the insulin-stimulated phosphorylation of the insulin receptor and its tyrosine kinase acitivity.

Wang *et al.*, 1999, Biochim. Biophys. Acta, 1431, 14-23, describe fluorescein monophosphates as fluorogenic substrates for PTPs.

Various methods and compounds have been developed to inhibit protein tyrosine phosphatase activity.

Wrobel *et al.*, 1999, J. Med. Chem., 42, 3199-3202, describe PTP-1B inhibition and antihyperglycemic activity in the ob/ob mouse model by 11-arylbenzo[b]naphtho[2,3-d]furans and arylbenzo[b]naphtho[2,3-d]thiophenes.

Andersen *et al.*, International PCT publication No. WO 98/DK407 describe the preparation of thienopyridzinones and thienochromenones as modulators of PTPases.

Taing *et al.*, 1999, Biochemistry, 38, 3793-3803, describe potent and highly selective inhibitors of PTP-1B comprising an array of bis(aryldifluorophosphonates).

Ham *et al.*, 1999, Bioorg. Med. Chem. Lett., 9, 185-186, describe selective inactivation of PTP-1B by a sulfone analog of naphthoquinone.

Desmarais *et al.*, 1999, Biochem, J., 337, 219-223, describe [Difluro(phosphono)methyl]phenylalanine-containing peptide inhibitors of PTPs.

Taylor *et al.*, 1998, Bioorg. Med. Chem., 6, 2235, describe potent non-peptidyl inhibitors of PTP-1B.

Kotoris *et al.*, 1998, Bioorg. Med. Chem. Lett., 8, 3275-3280, describe novel phosphate mimetics for the design of non-peptidyl inhibitors of PTPs.

Groves *et al.*, 1998, Biochemistry, 37, 17773-17783, describe the structural basis for PTP-1B inhibition by the phosphotyrosine peptide mimetics (difluoronaphthylmethyl)phosphonic acid and the fluoromalonyl tyrosines with complexed crystal structures.

Yao *et al.*, 1998, Bioorgl Med. Chem., 6, 1799-1810, describe the structure-based design and synthesis of small molecule PTP-1B inhibitors comprising novel naphthyldifluoromethyl phosphonic acids 1 and 2.

Taylor *et al.*, 1998, Bioorg. Med. Chem., 6, 1457-1468, describe potent non-peptidyl inhibitors of PTP-1B.

Desmarais *et al.*, 1998, Arch. Biochem. Biophys., 354, 225-231, describe inhibition of PTP-1B and CD45 by sulfotyrosyl peptides.

Mjalli *et al.*, application US 96-766114, cont. in part of US patent No. 543,630, describe the preparation of heterocyclic compounds as modulators of proteins with phosphotyrosine recognition units.

Wang *et al.*, 1998, Bioorg. Med. Chem. Lett., 8, 345-350, describe naphthalenebis[α,α-difluoromethylenephosphonates] as potent inhibitors of PTPs.

Rice *et al.*, 1997, Biochemistry, 36, 15965-15974, describe a targeted library of small molecule tyrosine and dual-specificity phosphatase inhibitors with random side chain variation from a rational core design.

Olefsky, International PCT publication No. WO 97/US2752 describes a method and phosphopeptides used for the treatment of insulin resistance based on the association of PTP-1B with the activated insulin receptor. Also included is a method for determining whether a compound inhibits PTP-1B binding to the insulin receptor.

Huyer *et al.*, 1997, J. Biol. Chem., 272, 843-851, describe the mechanism of inhibition of PTPases by vanadate and pervanadate.

Burke *et al.*, 1996, Biochemistry, 35, 15989-15996, describe the structure-based design of PTP-1B inhibitors.

Tonks *et al.*, International PCT publication No. WO 97/US13016, describe substrate-trapping protein PTPase mutants for identification of tyrosine-phosphorylated protein substrates and their clinical uses.

The human genome is thought to contain up to 100 PTPases, each varying slightly in chemistry but vastly in function. Compounds designed to inhibit PTP-1B activity specifically by covalent binding to or modification of PTP-1B have the potential for multiple side effects. Conventional drug substances that will potently suppress PTP-1B activity with few or no side effects from interaction with other PTPs are difficult to envision. A more attractive approach to PTP-1B modulation would involve the specific regulation of PTP-1B expression with oligonucleotides.

Identification of Potential Target Sites in Human PTP-1B RNA

The sequence of human PTP-1B was screened for accessible sites using a computer folding algorithm. Regions of the RNA that did not form secondary folding structures and contained potential ribozyme and/or antisense binding/cleavage sites were identified. The sequences of these cleavage sites are shown in **Tables 3-8.**

Selection of Enzymatic Nucleic Acid Cleavage Sites in Human PTP-1B RNA

To test whether the sites predicted by the computer-based RNA folding algorithm corresponded to accessible sites in PTP-1B RNA, 10 hammerhead ribozyme, five NCH and three G-Cleaver ribozyme sites were selected for further analysis (**Table 8**). Ribozyme target sites were chosen by analyzing sequences of Human PTP-1B (Genbank accession number M33689) and prioritizing the sites on the basis of folding. Ribozymes were designed that could bind each target and were individually analyzed by computer folding (Christoffersen *et al.*, 1994 *J. Mol. Struc. Theochem*, 311, 273; Jaeger *et al.*, 1989, *Proc. Natl. Acad. Sci. USA*, **86**, 7706) to assess whether the ribozyme sequences fold into the appropriate secondary structure. Those ribozymes with unfavorable intramolecular interactions between the binding arms and the catalytic core were eliminated from consideration. As noted below, varying binding arm lengths can be chosen to optimize activity. Generally, at least 5 bases on each arm are able to bind to, or otherwise interact with, the target RNA.

Chemical Synthesis and Purification of Ribozymes for Efficient Cleavage of PTP-1B RNA

Ribozymes were designed to anneal to various sites in the RNA message. The binding arms are complementary to the target site sequences described above. The ribozymes were chemically synthesized. The method of synthesis used followed the procedure for normal RNA synthesis as described above and in Usman et al., (1987 J. Am. Chem. Soc., 109, 7845), Scaringe et al., (1990 Nucleic Acids Res., 18, 5433) and Wincott et al., supra, and made use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The average stepwise coupling yields were >98%.

Ribozymes were also synthesized from DNA templates using bacteriophage T7 RNA polymerase (Milligan and Uhlenbeck, 1989, Methods Enzymol. 180, 51). Ribozymes were purified by gel electrophoresis using general methods or were purified by high pressure liquid chromatography (HPLC; see Wincott et al., supra; the totality of which is hereby incorporated herein by reference) and were resuspended in water. The sequences of the chemically synthesized ribozymes used in this study are shown below in **Tables 3-8.**

Ribozyme Cleavage of PTP-1B RNA Target *in vitro*

Ribozymes targeted to the human PTP-1B RNA are designed and synthesized as described above. These ribozymes can be tested for cleavage activity *in vitro*, for example, using the following procedure. The target sequences and the nucleotide location within the PTP-1B RNA are given in **Tables 3-8**.

Cleavage Reactions: Full-length or partially full-length, internally-labeled target RNA for ribozyme cleavage assay is prepared by *in vitro* transcription in the presence of [α-^{32}P] CTP, passed over a G 50 Sephadex column by spin chromatography and used as substrate RNA without further purification. Alternately, substrates are 5'-^{32}P-end labeled using T4 polynucleotide kinase enzyme. Assays are performed by pre-warming a 2X concentration of purified ribozyme in ribozyme cleavage buffer (50 mM Tris-HCl, pH 7.5 at 37°C, 10 mM $MgCl_2$) and the cleavage reaction was initiated by adding the 2X ribozyme mix to an equal volume of substrate RNA (maximum of 1-5 nM) that was also pre-warmed in cleavage buffer. As an initial screen, assays are carried out for 1 hour at 37°C using a final concentration of either 40 nM or 1 mM ribozyme, *i.e.*, ribozyme excess.

The reaction is quenched by the addition of an equal volume of 95% formamide, 20 mM EDTA, 0.05% bromophenol blue and 0.05% xylene cyanol after which the sample is heated to 95°C for 2 minutes, quick chilled and loaded onto a denaturing polyacrylamide gel. Substrate RNA and the specific RNA cleavage products generated by ribozyme cleavage are visualized on an autoradiograph of the gel. The percentage of cleavage is determined by Phosphor Imager® quantitation of bands representing the intact substrate and the cleavage products.

Example 3: MetAP-2

Methionyl aminopeptidases are metalloproteases that are known to possess post-translational enzymatic activity by hydrolytically cleaving amino-terminal methionine residues from nascent peptide substrates in a non-processive manner (Kendall, R. L., 1992, J. Biol. Chem., 267, 20667-20673). This family of enzymes is divided into two classes (type 1 and type 2) based on differences in sequence, although the overall structure of the two classes are similar (Liu, S., 1998, Science, 282, 1324-1327). Methionine aminopeptidase expression appears to be involved in the control of cellular proliferation. Deletion of the MetAP gene from *E. Coli* is lethal (Chang, S. Y., 1989, J. Bacteriol., 171, 4071-4072). In *Saccharomyces cerevisiae*, deletion of the gene that codes for either MetAP-1 or 2 results in a slow growth phenotype while deletion of both genes is lethal (Li, X., 1995, Proc. Natl. Acad. Sci., 92, 12357-12361). (Human methionine aminopeptidase-1, MetAP-1, accession No. P53582).

The aminopeptidase function of this class of enzymes may serve a regulatory role in activating signal peptides in conjunction with N-myristoyl transferase (NMT) activity. NMT is expressed from a lethal gene in yeast (Duronio, R. J., 1989, Science, 243, 796-800). NMT is responsible for amino-terminal ligation of myristic acid onto nascent peptides and cannot act on peptides with an amino-terminal methionine residue (Resh, M. D., 1996, Cell. Signal., 8, 403-412). Myristoylation of proteins correlates to intracellular localization events that may determine why certain signaling proteins are dependent on NMT for activity (Taunton, J., 1997, Chemistry & Biology, 4, 493-496). Protein tyrosine kinase Src is dependant on myristoylation for activity and has been identified as an upstream regulator of human vascular endothelial growth factor (VEGF) expression

through hypoxic induction in solid tumors (Mukhopadhyay, D., 1995, Nature, 375, 577-581). MetAPs may therefore regulate the activation of signal peptides (such as VEGF) through cotranslational modification of nascent peptides with NMT. Disruption of protein myristoylation by MetAP inhibition could result in the improper localization of signaling proteins resulting in inhibition of cell growth. (Human N-myristoyltransferase, hNMT, accession No. AF043324.)

Fumagillin, a sesquiterpene diepoxide metabolite of the fungus *Aspergillus fumigatus,* and a related compound TNP-470, are strong inhibitors of growth in cultured endothelial cells. The antiproliferative and angiostatic activity of fumagillin was originally discovered by the serendipitous contamination of *Aspergillus fumigatus* in an endothelial cell culture dish in which cells closest to the fungal colony displayed growth inhibition. Synthetic analogs of fumagillin were later synthesized resulting in the discovery of TNP-470, which is 50 times more potent of an inhibitor than fumagillin and is less toxic in mice (Ingber, D., 1990, Nature, 348, 555-557). Treatment of endothelial cells with these compounds results in late G1 phase arrest. TNP-470 inhibits the signaling pathway of retinoblastoma gene product phosphorylation, cyclin dependent kinases cdk2 and cdk4 activation, and cyclins E and A expression (Abe, J., 1994, Cancer Res., 54, 3407-3412). TNP-470 has also been shown to potently inhibit endothelial cell proliferation induced by the growth factors VEGF and bFGF (Toi, M., 1994, Oncology Reports, 1, 423-426).

The bifunctional protein MetAP-2 has been identified as the molecular target for fumagillin and related compounds that demonstrate antiproliferative activity in endothelial cells. The use of affinity chromatography with a fumagillin-biotin conjugate resulted in the isolation of a 67-kDa mammalian protein through covalent interaction with the bound substrate. Analysis of digested peptide fragments from the isolated protein revealed MetAP-2 as the covalently bound substrate. Subsequent growth inhibition studies in yeast utilizing MetAP-1 and MetAP-2 deletion strains determined that MetAP-2 is selectively inhibited by fumagillin *in vivo* (Sin, N., 1997, Proc. Natl. Acad. Sci., 94, 6099-6103). A similar study with TNP-470 and ovalicin, another potent inhibitor of neovascularization, determined that MetAP-2 is the molecular target for these fumagillin-related compounds (Griffith, E. C., 1997, Chemistry & Biology, 4, 461-471).

MetAP-2 expression correlates with cellular growth. Non-dividing cells in culture have no detectable levels of the 67-kDa MetAP-2 protein by immunoassay. MetAP-2 has been shown to affect translational initiation by association with eukaryotic initiation factor 2α (eIF-2α) (Ray, M. K., 1992, Proc. Natl. Acad. Sci., 89, 539-543). The binding of MetAP-2 with eIF-2α inhibits the heme-regulated inhibitor kinase (HRI) phosphorylation of eIF-2α *in vitro* in reticulocyte lysates (Datta, B., 1988, Proc. Natl. Acad. Sci., 85, 3324-3328). MetAP-2/eIF-2α binding results in the partial reversal of protein synthesis inhibition by double stranded RNA dependent kinase mediated phosphorylation *in vivo* (Wu, S., 1996, Biochemistry, 35, 8275-8280). Griffith *et al.* also determined that covalent binding of TNP-470 and ovalicin, while potently inhibiting methionine aminopeptidase type 2 activity specifically, did not affect the regulatory activity of MetAP-2 on eIF-2α. This finding by Griffith *et al.* rules out the possibility that control of eIF-2α phosphorylation by MetAP-2 is responsible for the inhibition of endothelial cell proliferation by fumagillin related compounds.

Particular angiogenesis related degenerative and disease states that can be associated with MetAP expression modulation include but are not limited to:

<u>Cancer</u>: Solid tumors are unable to grow or metastasize without the formation of new blood vessels (Hanahan, D., 1996, Cell, 86, 353-364). Inhibition of angiogenesis via MetAP modulation can potentially be used to treat a wide variety of cancers.

<u>Diabetic retinopathy and age related macular degeneration</u>: Ocular neovascularization is observed in diabetic retinopathy, which is mediated by up-regulation of VEGF (Adamis, A. P., 1994, Amer. J. Ophthal., 118, 445-450). The requirement of protein kinase Src in hypoxia induced VEGF expression (Mukhopadhyay, D., 1995, Nature, 375, 577-581) indicates that MetAP modulation of aminopeptidase activity can potentially be used to treat conditions involving ocular neovascularization.

<u>Arthritis</u>: The ingrowth of a vascular pannus in arthritis may be mediated by the overexpression of angiogenic factors from infiltrating inflammatory cells, macrophages, and immune cells (Peacock, D. J., 1992, J. exp. Med., 175, 1135-1138). Angiogenesis inhibition through MetAP modulation can potentially be used to treat arthritis.

Psoriasis: Angiogenesis has been implicated in psoriasis due to overexpression of the angiogenic polypeptide interleukin-8 and decreased expression of the angiogenesis inhibitor thrombospondin (Nickoloff, B. J., 1994, Amer. J. Pathol. 44, 820-828). Angiogenesis inhibition through MetAP modulation can potentially be used to treat psoriasis.

Female reproduction: Angiogenesis in the female reproductive system has been implicated in several disorders of the reproductive tract (Reynolds, L. P., 1992, FASEB, 6, 886-892). Modulation of angiogenesis through control of MetAP may have various applications in the area of female reproduction and fertility.

Various methods have been developed to assay MetAP activity.

Griffith *et al.*, 1998, Proc. Natl. Acad. Sci., 95, 15183-15188, describe an enzymatic assay for MetAP-2 activity *in vitro* and an endothelial cell culture proliferation assay for MetAP-2 activity *in vivo.*

Weber *et al.*, 1999, International PCT publication No. WO 98/US-21231 describe novel fluorescent reporter molecules and an enzymatic assay that can be used for determining the activity of MetAP-2 for drug screening and determining the chemosensitivity of human cancer cells to treatment with chemotherapeutic drugs.

Larrabee, J. A. *et al.*, 1999, Anal. Biochem, 269, 194-198, describe the use of a high-pressure liquid chromatographic (HPLC) method for assaying MetAP-2 activity with application to the study of enzymic inactivation.

Quantitative methods have been developed to assay the efficacy of antiangiogenic therapies.

Wantanabe *et al.*, 1992, Molec. Biol. Cell, 3, 324a, describe the quantitation of angiogenic peptides (bFGF) in human serum as a prognostic test for breast cancer.

Nguyen *et al.*, 1994, J. Natn. Cancer Inst., 86, 356-361, describe the quantitation of angiogenic peptides (bFGF) in the urine of patients with a wide spectrum of cancers.

Li *et al.*, 1994, The Lancet, 344, 82-86, describe the quantitation of angiogenic peptides (bFGF) in the cerebrospinal fluid of children with brain tumors. This work also describes determining the extent of neovascularization in histological sections by utilizing microvessel count.

The present body of knowledge in angiogenesis research indicates the need for compounds that can modulate MetAP activity for research, diagnostic, trait alteration, animal health and therapeutic use.

Griffith *et al.*, International PCT publication No. WO 9856372 describe small molecule inhibitors of MetAP2 and uses thereof.

D'Amato *et al.*, International PCT publication No. WO 9805293 describe the use of AGM-1470 (TNP-470) as an angiogenesis inhibitor for use in regulating the female reproductive system and for treating diseases of the reproductive tissue.

Davidson *et al.*, US patent No. 5,801,146 describe a compound and method for inhibiting angiogenesis using mammalian kringle 5 protein.

Cao *et al.*, US patent No. 5,854,221 describe a protein-based endothelial cell proliferation inhibitor and its method of use.

Chang *et al.*, US patent No. 5,888,796 describe a clone of a nucleotide sequence encoding a protein having two functions comprising methionine aminopeptidase activity and anti eIF-2 phosphorylation activity.

Wang *et al.*, 1998, Proc. Am. Assoc. Cancer Res., 39, 98 (abstr.) describe blocked proliferation of human endothelial cells by human MetAP-2 antisense oligonucleotides.

A rat corneal model has been developed to study ribozyme inhibition of VEGF receptor-mediated angiogenesis (Pavco, P. A., 1999, Nucleic Acids Research, 27, 2569-2577). A similar study employing MetAP-2 inhibition could be used to study ribozyme based inhibition of MetAP-2 induced angiogenesis *in vivo.*

Identification of Potential Target Sites in Human MetAP-2 RNA

The sequence of human MetAP-2 was screened for accessible sites using a computer-folding algorithm. Regions of the RNA that did not form secondary folding structures and contained potential ribozyme and/or antisense binding/cleavage sites were identified. The sequences of these cleavage sites are shown in **Tables 9-12.**

Selection of Enzymatic Nucleic Acid Cleavage Sites in Human MetAP-2 RNA

To test whether the sites predicted by the computer-based RNA folding algorithm corresponded to accessible sites in MetAP-2 RNA, 11 hammerhead ribozyme, 4 NCH and three G-Cleaver ribozyme sites were selected for further analysis (**Table 12**). Ribozyme

target sites were chosen by analyzing sequences of Human MetAP-2 (Genbank accession number HSU29607) and prioritizing the sites on the basis of folding. Ribozymes were designed that could bind each target and were individually analyzed by computer folding (Christoffersen *et al.,* 1994 *J. Mol. Struc. Theochem,* 311, 273; Jaeger *et al.*, 1989, *Proc. Natl. Acad. Sci. USA*, **86**, 7706) to assess whether the ribozyme sequences fold into the appropriate secondary structure. Those ribozymes with unfavorable intramolecular interactions between the binding arms and the catalytic core were eliminated from consideration. As noted below, varying binding arm lengths can be chosen to optimize activity. Generally, at least 5 bases on each arm are able to bind to, or otherwise interact with, the target RNA.

Chemical Synthesis and Purification of Ribozymes for Efficient Cleavage of MetAP-2 RNA

Ribozymes were designed to anneal to various sites in the RNA message. The binding arms are complementary to the target site sequences described above. The ribozymes were chemically synthesized. The method of synthesis used followed the procedure for normal RNA synthesis as described above and in Usman et al., (1987 J. Am. Chem. Soc., 109, 7845), Scaringe et al., (1990 Nucleic Acids Res., 18, 5433) and Wincott et al., supra, and made use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The average stepwise coupling yields were >98%.

Ribozymes were also synthesized from DNA templates using bacteriophage T7 RNA polymerase (Milligan and Uhlenbeck, 1989, Methods Enzymol. 180, 51). Ribozymes were purified by gel electrophoresis using general methods or were purified by high pressure liquid chromatography (HPLC; see Wincott et al., supra; the totality of which is hereby incorporated herein by reference) and were resuspended in water. The sequences of the chemically synthesized ribozymes used in this study are shown below in **Table 9-12.**

Ribozyme Cleavage of MetAP-2 RNA Target *in vitro*

Ribozymes targeted to the human MetAP-2 RNA are designed and synthesized as described above. These ribozymes can be tested for cleavage activity *in vitro*, for

example, using the following procedure. The target sequences and the nucleotide location within the MetAP-2 RNA are given in **Tables 9-12**.

Cleavage Reactions: Full-length or partially full-length, internally-labeled target RNA for ribozyme cleavage assay is prepared by *in vitro* transcription in the presence of [a-^{32}p] CTP, passed over a G 50 Sephadex column by spin chromatography and used as substrate RNA without further purification. Alternately, substrates are 5'-^{32}P-end labeled using T4 polynucleotide kinase enzyme. Assays are performed by pre-warming a 2X concentration of purified ribozyme in ribozyme cleavage buffer (50 mM Tris-HCl, pH 7.5 at 37°C, 10 mM $MgCl_2$) and the cleavage reaction was initiated by adding the 2X ribozyme mix to an equal volume of substrate RNA (maximum of 1-5 nM) that was also pre-warmed in cleavage buffer. As an initial screen, assays are carried out for 1 hour at 37°C using a final concentration of either 40 nM or 1 mM ribozyme, *i.e.*, ribozyme excess. The reaction is quenched by the addition of an equal volume of 95% formamide, 20 mM EDTA, 0.05% bromophenol blue and 0.05% xylene cyanol after which the sample is heated to 95°C for 2 minutes, quick chilled and loaded onto a denaturing polyacrylamide gel. Substrate RNA and the specific RNA cleavage products generated by ribozyme cleavage are visualized on an autoradiograph of the gel. The percentage of cleavage is determined by Phosphor Imager® quantitation of bands representing the intact substrate and the cleavage products.

Example 4: BACE, ps-1, ps-2

Alzheimer's disease (AD) is a progressive, degenerative disease of the brain which affects approximately 4 million people in the United States alone. An estimated 14 million Americans will have Alzheimer's disease by the middle of the next century if no cure or definitive prevention of the disease is found. Nearly one out of ten people over age 65 and nearly half of those over 85 have Alzheimer's disease. Alzheimer's disease is not confined to the elderly, a small percentage of people in their 30's and 40's are afflicted with early onset AD. Alzheimer's disease is the most common form of dementia, and amounts to the third most expensive disease in the US following heart disease and cancer. An estimated 100 billion dollars are spent annually on Alzheimer's disease (National Alzheimer's Association, 1999).

Alzheimer's disease is characterized by the progressive formation of insoluble plaques and vascular deposits in the brain consisting of the 4 kD amyloid β peptide (Aβ). These plaques are characterized by dystrophic neurites that show profound synaptic loss, neurofibrillary tangle formation, and gliosis. Aβ arises from the proteolytic cleavage of the large type I transmembrane protein, β-amyloid precursor protein (APP) (Kang *et al.*, 1987, *Nature,* 325, 733). Processing of APP to generate Aβ requires two sites of cleavage by a β-secretase and a γ-secretase. β-secretase cleavage of APP results in the cytoplasmic release of a 100 kD soluble amino-terminal fragment, APPsβ, leaving behind a 12 kD transmembrane carboxy-terminal fragment, C99. Alternately, APP can be cleaved by a α-secretase to generate cytoplasmic APPsα and transmembrane C83 fragments. Both remaining transmembrane fragments, C99 and C83, can be further cleaved by a γ-secretase, leading to the release and secretion of Alzheimer's related Aβ and a non-pathogenic peptide, p3, respectively (Vassar *et al.*, 1999, *Science,* 286, 735-741). Early onset familial Alzheimer's disease is characterized by mutant APP protein with a Met to Leu substitution at position P1, characterized as the "Swedish" familial mutation (Mullan *et al.*, 1992, *Nature Genet.*, 1, 345). This APP mutation is characterized by a dramatic enhancement in β-secretase cleavage (Citron *et al.*, 1992, *Nature,* 360, 672).

The identification of β-secretase, and γ-secretase constituents involved in the release of β-amyloid protein is of primary importance in the development of treatment strategies for Alzheimer's disease. Characterization of α-secretase is also important in this regard since α-secretase cleavage may compete with β-secretase cleavage resulting in non-pathogenic vs. pathogenic protein production. Involvement of the two metalloproteases, ADAM 10, and TACE has been demonstrated in α-cleavage of AAP (Buxbaum *et al.*, 1999, *J. Biol. Chem.*, 273, 27765, and Lammich *et al.*, 1999, *Proc. Natl. Acad. Sci. U.S.A.*, 96, 3922). Studies of γ-secretase activity have demonstrated presenilin dependence (De Stooper *et al.*, 1998, *Nature,* 391, 387, and De Stooper *et al.*, 1999, *Nature,* 398, 518), and as such, presenilins have been proposed as γ-secretase even though presenilin does not present proteolytic activity (Wolfe *et al.*, 1999, *Nature,* 398, 513).

Recently, Vassar *et al.*, 1999, *supra* reported β-secretase cleavage of AAP by the transmembrane aspartic protease beta site APP cleaving enzyme, BACE. While other potential candidates for β-secretase have been proposed (for review see Evin *et al.*, 1999, *Proc. Natl. Acad. Sci. U.S.A.*, 96, 3922), none have demonstrated the full range of characteristics expected from this enzyme. Vassar *et al*, *supra*, demonstrate that BACE expression and localization are as expected for β-secretase, that BACE overexpression in cells results in increased β-secretase cleavage of APP and Swedish APP, that isolated BACE demonstrates site specific proteolytic activity on APP derived peptide substrates, and that antisense mediated endogenous BACE inhibition results in dramatically reduced β-secretase activity.

Current treatment strategies for Alzheimer's disease rely on either the prevention or the alleviation of symptoms and/or the slowing down of disease progression. Two drugs approved in the treatment of Alzheimer's, donepezil (Aricept®) and tacrine (Cognex®), both cholinomimetics, attempt to slow the loss of cognitive ability by increasing the amount of acetylcholine available to the brain. Antioxidant therapy through the use of antioxidant compounds such as alpha-tocopherol (vitamin E), melatonin, and selegeline (Eldepryl®) attempt to slow disease progression by minimizing free radical damage. Estrogen replacement therapy is thought to incur a possible preventative benefit in the development of Alzheimer's disease based on limited data. The use of anti-inflammatory drugs may be associated with a reduced risk of Alzheimer's as well. Calcium channel blockers such as Nimodipine® are considered to have a potential benefit in treating Alzheimer's disease due to protection of nerve cells from calcium overload, thereby prolonging nerve cell survival. Nootropic compounds, such as acetyl-L-carnitine (Alcar®) and insulin, have been proposed to have some benefit in treating Alzheimer's due to enhancement of cognitive and memory function based on cellular metabolism.

Whereby the above treatment strategies may all improve quality of life in Alzheimer's patients, there exists an unmet need in the comprehensive treatment and prevention of this disease. As such, there exists the need for therapeutics effective in reversing the physiological changes associated with Alzheimer's disease, specifically, therapeutics that can eliminate and/or reverse the deposition of amyloid β peptide. The use of compounds to modulate the expression of proteases that are instrumental in the

release of amyloid β peptide, namely β-secretase (BACE), and γ-secretase (presenilin), is of therapeutic significance.

Tsai *et al.*, 1999, Book of Abstrasts, 218th ACS National Meeting, New Orleans, Aug 22-26, describe substrate-based alpha-aminoisobutyric acid derivatives of difluoro ketone peptidomimetic inhibitors of amyloid β peptide through γ-secretase inhibition.

Czech *et al.*, International PCT publication No. WO/9921886, describe peptides capable of inhibiting the interaction between presenilins and the β-amyloid peptide or its precursor for therapeutic use.

Fournier *et al.*, International PCT publication No. WO/9916874, describe human brain proteins capable of interacting with presenilins and cDNAs encoding them toward therapeutic use.

St. George-Hyslop *et al.*, International PCT publication No. WO/9727296, describe genes for proteins that interact with presenilins and their role in Alzheimer's disease toward therapeutic use.

Vassar *et al.*, 1999, *Science*, 286, 735-741, describe specific antisense oligonucleotides targeting BACE, used for inhibition studies of endogenous BACE expression in 101 cells and APPsw cells via lipid mediated transfection.

Vassar *et al.*, 1999, *Science*, 286, 735-741, describe a cell culture model for studying BACE inhibition. Specific antisense nucleic acid molecules targeting BACE mRNA were used for inhibition studies of endogenous BACE expression in 101 cells and APPsw (Swedish type amyloid precursor protein expressing) cells via lipid mediated transfection. Antisense treatment resulted in dramatic reduction of both BACE mRNA by Northern blot analysis, and APPsβsw ("Swedish" type β-secretase cleavage product) by ELISA, with maximum inhibition of both parameters at 75-80%. This model was also used to study the effect of BACE inhibition on amyloid β-peptide production in APPsw cells.

Games *et al.*, 1995, *Nature*, 373, 523-527, describe a transgenic mouse model in which mutant human familial type APP (Phe 717 instead of Val) is overexpressed. This model results in mice that progressively develop many of the pathological hallmarks of Alzheimer's disease, and as such, provides a model for testing therapeutic drugs.

Particular degenerative and disease states that can be associated with BACE expression modulation include but are not limited to Alzheimer's disease and dementia.

Donepezil, tacrine, selegeline, and acetyl-L-carnitine are non-limiting examples of pharmaceutical agents that can be combined with or used in conjunction with the nucleic acid molecules (e.g. ribozymes and antisense molecules) of the instant invention. Those skilled in the art will recognize that other drugs such as diuretic and antihypertensive compounds and therapies can be similarly be readily combined with the nucleic acid molecules of the instant invention (e.g. ribozymes and antisense molecules) are hence within the scope of the instant invention.

Identification of Potential Target Sites in Human BACE RNA

The sequence of human BACE was screened for accessible sites using a computer-folding algorithm. Regions of the RNA that did not form secondary folding structures and contained potential ribozyme and/or antisense binding/cleavage sites were identified. The sequences of these cleavage sites are shown in **Tables 18-23.**

Selection of Enzymatic Nucleic Acid Cleavage Sites in Human BACE RNA

Ribozyme target sites were chosen by analyzing sequences of Human BACE (Genbank sequence accession number: AF190725) and prioritizing the sites on the basis of folding. Ribozymes were designed that could bind each target and were individually analyzed by computer folding (Christoffersen *et al.*, 1994 *J. Mol. Struc. Theochem*, 311, 273; Jaeger *et al.*, 1989, *Proc. Natl. Acad. Sci. USA*, 86, 7706) to assess whether the ribozyme sequences fold into the appropriate secondary structure. Those ribozymes with unfavorable intramolecular interactions between the binding arms and the catalytic core were eliminated from consideration. As noted below, varying binding arm lengths can be chosen to optimize activity. Generally, at least 5 bases on each arm are able to bind to, or otherwise interact with, the target RNA.

Chemical Synthesis and Purification of Ribozymes and Antisense for Efficient Cleavage and/or blocking of BACE RNA

Ribozymes and antisense constructs were designed to anneal to various sites in the RNA message. The binding arms of the ribozymes are complementary to the target site sequences described above, while the antisense constructs are fully complimentary to the target site sequences described above. The ribozymes and antisense constructs were

chemically synthesized. The method of synthesis used followed the procedure for normal RNA synthesis as described above and in Usman et al., (1987 *J. Am. Chem. Soc.*, 109, 7845), Scaringe et al., (1990 *Nucleic Acids Res.*, 18, 5433) and Wincott et al., *supra*, and made use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The average stepwise coupling yields were >98%.

Ribozymes and antisense constructs were also synthesized from DNA templates using bacteriophage T7 RNA polymerase (Milligan and Uhlenbeck, 1989, *Methods Enzymol.* 180, 51). Ribozymes and antisense constructs were purified by gel electrophoresis using general methods or were purified by high pressure liquid chromatography (HPLC; See Wincott et al., *supra*; the totality of which is hereby incorporated herein by reference) and were resuspended in water. The sequences of the chemically synthesized ribozymes and antisense constructs used in this study are shown below in **Table 18-23.**

Ribozyme Cleavage of BACE RNA Target *in vitro*

Ribozymes targeted to the human BACE RNA are designed and synthesized as described above. These ribozymes can be tested for cleavage activity *in vitro*, for example, using the following procedure. The target sequences and the nucleotide location within the BACE RNA are given in **Tables 18-23**.

Cleavage Reactions: Full-length or partially full-length, internally-labeled target RNA for ribozyme cleavage assay is prepared by *in vitro* transcription in the presence of [a-^{32}p] CTP, passed over a G 50 Sephadex column by spin chromatography and used as substrate RNA without further purification. Alternately, substrates are 5'-^{32}P-end labeled using T4 polynucleotide kinase enzyme. Assays are performed by pre-warming a 2X concentration of purified ribozyme in ribozyme cleavage buffer (50 mM Tris-HCl, pH 7.5 at 37°C, 10 mM $MgCl_2$) and the cleavage reaction was initiated by adding the 2X ribozyme mix to an equal volume of substrate RNA (maximum of 1-5 nM) that was also pre-warmed in cleavage buffer. As an initial screen, assays are carried out for 1 hour at 37°C using a final concentration of either 40 nM or 1 mM ribozyme, *i.e.*, ribozyme excess. The reaction is quenched by the addition of an equal volume of 95% formamide, 20 mM

EDTA, 0.05% bromophenol blue and 0.05% xylene cyanol after which the sample is heated to 95°C for 2 minutes, quick chilled and loaded onto a denaturing polyacrylamide gel. Substrate RNA and the specific RNA cleavage products generated by ribozyme cleavage are visualized on an autoradiograph of the gel. The percentage of cleavage is determined by Phosphor Imager® quantitation of bands representing the intact substrate and the cleavage products.

Example 5: Phospholamban

Cardiac disease leading to heart failure is the leading cause of combined morbidity and mortality in the developed world. Nearly twenty million people worldwide suffer from heart failure related disease. An estimated five million Americans are afflicted with congestive heart failure (CHF), with 400,000 new cases diagnosed each year. In the US, cardiac disease associated failure results in approximately 40,000 deaths per year, and is associated with an additional 250,000 deaths (Harnish, 1999, *Drug & Market Development*, 10, 114-119). Heart failure related disease represents a major public health issue due to an overall increase in prevalence and incidence in aging populations with a greater proportion of survivors of acute myocardial infarction (AMI) (Kannel *et al.,* 1994, *Br. Heart. J.*, 72 (suppl), 3). Heart failure related disease represents the most common reason for hospitalization of elderly patients in the US. The resulting life expectancy of these patients is less than that of many common cancers, with five year survival rates for men and women at only 25% and 38% respectively, and with one year mortality rates for severe heart failure at 50% (Ho *et al.,* 1993, *Circulation*, 88, 107).

Heart disease is characterized by a progressive decrease in cardiac output resulting from insufficient pumping activity of the diseased heart. The resulting venous back-pressure results in peripheral and pulmonary dysfunctional congestion. The heart responds to a variety of mechanical, hemodynamic, hormonal, and pathological stimuli by increasing muscle mass in response to an increased demand for cardiac output. The resulting transformation of heart tissue (myocardial hypertrophy) can arise as a result of genetic, physiologic, and environmental factors, and represents an early indication of clinical heart disease and an important risk factor for subsequent heart failure (Hunter and Chien, 1999, *New England J. of Medicine*, 99, 313-322).

Coronary heart disease is a predominant factor in the development of the cardiac disease state, along with prior AMI, hypertension, diabetes mellitus, and valvular heart disease. Diagnosis of cardiac disease includes determination of coronary heart disease associated left ventricular systolic dysfunction (LVSD) and/or left ventricular diastolic dysfunction (LVDD) by echocaardiographic imaging (Cleland, 1997, *Dis Management Health Outcomes*, 1, 169). Promising diagnosis may also rely on assaying atrial natriuretic peptide (ANP) and brain natriuretic peptide (BNP) concentrations. ANP and BNP levels are indicative of the level of ventricular dysfunction (Davidson *et al.*, 1996, *Am. J. Cardiol.*, 77, 828).

Current treatment strategies for cardiac disease associated failure are varied. Diuretics are often used to reduce pulmonary edema and dyspnea in patients with fluid overload, and are usually used in conjunction with angiotensin converting enzyme (ACE) inhibitors for vasodilation. Digoxin is another popular choice for treating cardiac disease as an ionotropic agent, however, doubts remain concerning the long-term efficacy and safety of Digoxin (Harnish, 1999, *Drug & Market Development*, 10, 114-119). Carvedilol, a beta-blocker, has been introduced to complement the above treatments in order to slow down the progression of cardiac disease. Antiarrhythmic agents can be used in order to reduce the risk of sudden death in patients suffering from cardiac disease. Lastly, heart transplants have been effective in the treatment of patients with advanced stages of cardiac disease, however, the limited supply of donor hearts greatly limits the scope of this treatment to the broad population (Harnish, 1999, *Drug & Market Development*, 10, 114-119).

Whereby the above treatment strategies can all improve morbidity and mortality associated with cardiac disease, the only existing definitive approach to curing the diseased heart is replacement by transplant. Even a healthy, transplanted heart can become diseased in response to the various stresses of mechanical, hemodynamic, hormonal, and pathological stimuli associated with extrinsic risk factors. As such there exists the need for therapeutics effective in reversing the physiological changes associated with cardiac disease.

Myocardial hypertrophy and apoptosis are the underlying degenerative process associated with cardiac hypertrophy and failure. A variety of signaling pathways are involved in the progression of myocardial hypertrophy and myocardial apoptosis. Genetic

studies have been instrumental in elucidating these pathways and their involvement in cardiac disease through *in vitro* assays of cardiac muscle cells and *in vivo* studies of genetically engineered animals.

Studies in which the expression of specific genes have been altered in cardiac myocytes have shown that specific peptide hormones, growth factors, and cytokines can activate various features of the hypertrophic response (Hunter and Chien, 1999, *New England J of Medicine*, 99, 313-322). Particular substances that have been characterized from these studies include potential therapeutic and molecular targets involved in heart failure. Hunter *et al.*, in Chien, KR, ed. *Molecular basis of heart disease: a companion to Braunwald's Heart Disease*, Philadelphia: W.B. Saunders, 1999:211-250, describe classes of therapeutic and molecular targets involved in heart failure including:

1. Endothelin 1 and angiotensin II receptor antagonists, and antagonists of ras, p38, and c-jun N-terminal kinase (JNK) for inhibition of pathologic hypertrophy.
2. Insulin like growth factor I and growth hormone receptor stimulation for promotion of physiologic hypertrophy.
3. beta-1-adrenergic receptor blockers for inhibition of neurohumoral over stimulation.
4. Phospholamban and Sarcolipin small molecule inhibitors for relief of sarcoplasmic reticulum calcium ATPase inhibition to provide enhancement of myocardial contractile and relaxation responses.
5. Small molecule inhibitors of β-adrenergic receptor kinase to counteract the desensitization of G protein coupled receptor kinases in order to provide enhancement of myocardial contractile and relaxation responses.
6. Enhancement of angiogenic growth factors (VEGF, FGF-5) for relief of energy deprivation in cardiac tissues.
7. Promoters of myocyte survival including gp 130 ligands (cardiotrophin 1), and Neuregulin for the inhibition of apoptosis of myocytes.
8. Inhibitors of apoptosis such as Caspase inhibitors for the inhibition of apoptosis of myocytes.
9. Inhibitors of cytokines such as TNF-alpha for the inhibition of apoptosis of myocytes.

Congestive heart failure, heart failure, dilated cardiomyopathy and pressure overload hypertrophy are nonlimiting examples of disorders and disease states that can be associated with the above classes of molecular targets.

The failure of cardiac contractile performance leading to cardiac disorders and disease, governed by impairment of cardiac excitation/contraction coupling, points to the importance of the signaling pathways involved in this process. The release and uptake of cytosolic Ca^{2+} by the sarcoplasmic reticulum plays an integral role in each cycle of cardiac contraction and excitation (Minamisawa *et al.*, 1999, *Cell*, 99, 313-322). The process of Ca^{2+} reuptake is mediated by the cardiac sarcoplasmic reticulum Ca^{2+} ATPase (SERCA2a). SERCA2a activity is regulated by phospholamban, a p52 muscle specific sarcoplasmic reticulum phosphoprotein (Koss *et al.*, 1996, *Circ. Res.*, 79, 1059-1063, and Simmerman *et al.*, 1998, *Physiol. Rev.*, 78, 921-947). In its active, unphosphorylated state, phospholamban is a potent inhibitor of SERCA2a activity. Phosphorylation of phospholamban at serine 16 by cyclic AMP-dependent protein kinase (PKA) or calmodulin kinase, results in the inhibition of phospholamban interaction with SERCA2a. This phosphorylation event is predominantly responsible for the proportional increase in the rate of Ca^{2+} uptake into the sarcoplasmic reticulum and resultant ventricular relaxation (Tada *et al.*, 1982, *Mol. Cell. Biochem.*, 46, 73-95, and Luo *et al.*, 1998, *J. Biol. Chem.*, 273, 4734-4739).

Since a proportional decrease in Ca^{2+} uptake is a hallmark feature of heart failure (Sordahl *et al.*, 1973, *Am. J. Physiol.*, 224, 497-502) and since an increase in the relative ratio of phospholamban to SERCA2a is an important determinant of sarcoplasmic reticulum dysfunction in heart failure (Hasenfuss, 1998, *Cardiovasc. Res.*, 37, 279-289), the targeting of phospholamban and related regulatory factors as therapeutic targets for heart disorders should prove valuable for cardiac indications.

Pystynen *et al.*, International PCT publication No. WO 99/00132, describe bisethers of 1-oxa, aza and thianaphthalen-2-ones as small molecule inhibitors of phospholamban for increasing coronary flow via direct dilation of the coronary arteries.

Pystynen *et al.*, International PCT publication No. WO 99/15523, describe bisethers of 1-oxa, aza and thianaphthalen-2-ones as small molecule inhibitors of phospholamban that are useful for treating heart failure.

The efficacy of the above mentioned treatment strategies is limited. Small molecule inhibition of a molecular target is often limited by toxicity, which can restrict dosing and overall efficacy.

He *et al.*, 1999, *Circulation*, 100, 974-980, describe endogenous expression of mutant phospholamban and phospholamban antisense RNA to investigate the corresponding effect on SERCA2a activity and cardiac myocyte contractility.

A more attractive approach to the treatment of heart disease would involve the use of ribozymes and/or antisense constructs to modulate the expression of target molecules involved in heart failure. The use of nucleic acid molecules of the instant invention permits highly specific regulation of the molecular targets of interest, including phospholamban (PLN) (GenBank accession No. NM_002667), sarcolipin (SLN) (GenBank accession No. NM_003063), angiotensin II receptor (GenBank accession No. U20860), endothelin 1 receptor (GenBank accession No. NM_001957), K-ras (GenBank accession No. NM_004985), p38 (GenBank accession No. AF092535), c-jun N-terminal kinase (GenBank accession No. NM_002750, L31951, NM_002753), growth hormone receptor (GenBank accession No. NM_000163), insulin-like growth factor I receptor (GenBank accession No. NM_000875), beta-1-adrenergic receptor (GenBank accession No. NM_000024), β1-adrenergic receptor kinase (GenBank accession No. NM_001619, NM_005160), VEGF receptor (GenBank accession No. U43368, M27281 X15997), fibroblast growth factor 5 (GenBank accession No. NM_004464), cardiotrophin I (GenBank accession No. NM_001330), neuregulin (GenBank accession No. AF009227), TNF-alpha (GenBank accession No. X02910 X02159), PI3 kinase (GenBank accession No. NM_006218, NM_006219, U86453, NM_002649, M61906), and AKT kinase (GenBank accession No. NM_005163, M77198).

Various methods have been developed to assay phospholamban activity *in vitro* and *in vivo*. Holt *et al.*, 1999, J. *Mol. Cell. Cardiol.*, 31, 645-656, describe a cell culture model in which thyroid hormone control of contraction and the Ca^{2+}-ATPase/phospholamban complex is studied in adult rat ventricular myocytes. Slack *et al.* 1997, *J. Biol. Chem.*, 272, 18862-18868, describe studies in which the ectopic expression of phospholamban in mouse fast-twitch skeletal muscle cells alters sarcoplasmic reticulum Ca^{2+} transport and muscle relaxation. MacLennan *et al.*, 1996, *Soc. Gen. Physiol. Ser.*, 51, 89-103, in a review of regulatory interactions between calcium ATPases and phospholamban describe phospholamban/ Ca^{2+}-ATPase interactions in protein expressed in heterologous cell culture experiments. Cornwell *et al.*, 1991, *Mol. Pharmacol.*, 40,923-931, describe the

regulation of sarcoplasmic reticulum protein phosphorylation by localized cyclic GMP-dependent protein kinase in vascular smooth muscle cells.

Minamisawa *et al.*, 1999, *Cell*, 99, 313-322, describe a phospholamban knockout mouse model which affords protection from induced dilated cardiomyopathy. Dillmann *et al.*, 1999, *Am. J. Cardiol.*, 83, 89H-91H, describe a transgenic rat model for the study of altered expression of calcium regulatory proteins, including phospholamban, and their effect on myocyte contractile response. LekanneDeprez *et al.*, 1998, *J. Mol. Cell. Cardiol.*, 30, 1877-1888, describe a rat pressure-overload model to investigate alterations in gene expression of phospholamban, atrial natriuretic peptide (ANP), sarcoplasmic endoplasmic reticular calcium ATPase 2 (SERCA2), collagen IIIα1, and calsequestrin (CSQ). Jones *et al.*, 1998, *J. Clin. Invest.*, 101, 1385-1393, describe a mouse model for investigating the regulation of calcium signaling in transgenic mouse cardiac myocytes overexpressing calsequestrin. In this study, the upregulation and downregulation of calcium uptake and release proteins were determined, including phospholamban. Lorenz *et al.*, 1997, *Am J. Physiol.*, 273, 6, describe a mouse model for the study of regulatory effects of phospholamban on cardiac function in intact mice. This study makes use of animal models with altered levels of phospholamban to permit *in vivo* evaluation of the physiological role of phospholamban. Arai *et al.*, 1996, *Saishin Igaku*, 51, 1095-1104, presents a review article of gene targeted animal models expressing cardiovascular abnormalities. The study of phospholamban and other protein expression modification effects in mice is presented. Wankerl *et al.*, 1995, *J. Mol. Med.*, 73, 487-496, presents a review article describing the study of calcium transport proteins in the nonfailing and failing heart. Animal models investigating the major calcium handling myocardial proteins, including phospholamban, are described. These models, as well as others, may be used to evaluate the effect of treatment with nucleic acid molecules of the instant invention on cardiac function. Endpoints may be, but are not limited to, left ventricular pressure, left ventricular pressure as a function of time (LVdP/dt), and mean arterial blood pressure. Endpoints will be evaluated under basal and stimulated (cardiac load) conditions.

Particular degenerative and disease states that can be associated with phospholamban expression modulation include but are not limited to congestive heart failure, heart failure, dilated cardiomyopathy and pressure overload hypertrophy:

Digoxin, Bendrofluazide, Dofetilide, and Carvedilol are non-limiting examples of pharmaceutical agents that can be combined with or used in conjunction with the nucleic acid molecules (*e.g.* ribozymes and antisense molecules) of the instant invention. Those skilled in the art will recognize that other drugs such as diuretic and antihypertensive compounds and therapies can be similarly be readily combined with the nucleic acid molecules of the instant invention (*e.g.* ribozymes and antisense molecules) are hence within the scope of the instant invention.

Identification of Potential Target Sites in Human phospholamban RNA

The sequence of human phospholamban was screened for accessible sites using a computer folding algorithm. Regions of the RNA that did not form secondary folding structures and contained potential ribozyme and/or antisense binding/cleavage sites were identified. The sequences of these cleavage sites are shown in **Tables 24-30.**

Selection of Enzymatic Nucleic Acid Cleavage Sites in Human phospholamban RNA

Ribozyme target sites were chosen by analyzing sequences of Human phospholamban (Genbank sequence accession number: NM_002667) and prioritizing the sites on the basis of folding. Ribozymes were designed that could bind each target and were individually analyzed by computer folding (Christoffersen *et al.,* 1994 *J. Mol. Struc. Theochem,* 311, 273; Jaeger *et al.*, 1989, *Proc. Natl. Acad. Sci. USA*, **86**, 7706) to assess whether the ribozyme sequences fold into the appropriate secondary structure. Those ribozymes with unfavorable intramolecular interactions between the binding arms and the catalytic core were eliminated from consideration. As noted below, varying binding arm lengths can be chosen to optimize activity. Generally, at least 5 bases on each arm are able to bind to, or otherwise interact with, the target RNA.

Chemical Synthesis and Purification of Ribozymes and Antisense for Efficient Cleavage and/or blocking of phospholamban RNA

Ribozymes and antisense constructs were designed to anneal to various sites in the RNA message. The binding arms of the ribozymes are complementary to the target site sequences described above, while the antisense constructs are fully complimentary to the target site sequences described above. The ribozymes and antisense constructs were

chemically synthesized. The method of synthesis used followed the procedure for normal RNA synthesis as described above and in Usman et al., (1987 J. Am. Chem. Soc., 109, 7845), Scaringe et al., (1990 Nucleic Acids Res., 18, 5433) and Wincott et al., *supra*, and made use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The average stepwise coupling yields were >98%.

Ribozymes and antisense constructs were also synthesized from DNA templates using bacteriophage T7 RNA polymerase (Milligan and Uhlenbeck, 1989, Methods Enzymol. 180, 51). Ribozymes and antisense constructs were purified by gel electrophoresis using general methods or were purified by high pressure liquid chromatography (HPLC; see Wincott et al., supra; the totality of which is hereby incorporated herein by reference) and were resuspended in water. The sequences of the chemically synthesized ribozymes and antisense constructs used in this study are shown below in **Table 24-30.**

Ribozyme Cleavage of phospholamban RNA Target *in vitro*

Ribozymes targeted to the human phospholamban RNA are designed and synthesized as described above. These ribozymes can be tested for cleavage activity *in vitro*, for example using the following procedure. The target sequences and the nucleotide location within the phospholamban RNA are given in **Tables 24-30.**

Cleavage Reactions: Full-length or partially full-length, internally-labeled target RNA for ribozyme cleavage assay is prepared by *in vitro* transcription in the presence of [a-^{32}p] CTP, passed over a G 50 Sephadex column by spin chromatography and used as substrate RNA without further purification. Alternately, substrates are 5'-^{32}P-end labeled using T4 polynucleotide kinase enzyme. Assays are performed by pre-warming a 2X concentration of purified ribozyme in ribozyme cleavage buffer (50 mM Tris-HCl, pH 7.5 at 37°C, 10 mM $MgCl_2$) and the cleavage reaction was initiated by adding the 2X ribozyme mix to an equal volume of substrate RNA (maximum of 1-5 nM) that was also pre-warmed in cleavage buffer. As an initial screen, assays are carried out for 1 hour at 37°C using a final concentration of either 40 nM or 1 mM ribozyme, *i.e.*, ribozyme excess. The reaction is quenched by the addition of an equal volume of 95% formamide, 20 mM

EDTA, 0.05% bromophenol blue and 0.05% xylene cyanol after which the sample is heated to 95°C for 2 minutes, quick chilled and loaded onto a denaturing polyacrylamide gel. Substrate RNA and the specific RNA cleavage products generated by ribozyme cleavage are visualized on an autoradiograph of the gel. The percentage of cleavage is determined by Phosphor Imager® quantitation of bands representing the intact substrate and the cleavage products.

Tissue distribution of BrdU-labeled antisense in mice

CD1 mice were injected with a single bolus (30 mg/kg) of a BrdU-labeled antisense oligonucleotide or a similar molar amount of BrdU (as a control). At various time points (30 min, 2h and 6 h), mice were sacrificed and major tissues isolated and fixed. Distribution of antisense oligonucleotides was determined by probing with an anti-BrdU antibody and immunohistochemical staining. Tissue slices were probed with an anti-BrdU antibody followed by a reporter enzyme-conjugated second antibody and finally an enzyme substrate. Visualization of the colored product by microscopy indicated nuclear staining, demonstrating effective distribution of antisense oligonucleotide in cardiac tissue.

Tissue distribution of BrdU-labeled ribozymes in monkey

Rhesus monkeys were dosed with BrdU-labeled ribozyme by intravenous bolus injection at 0.1, 1.0, and 10 mg/kg once daily over five days. Saline injection was used in control animals. Animals were sacrificed and major tissues isolated and fixed. Tissue samples were probed with an anti-BrdU antibody followed by a reporter enzyme-conjugated second antibody and finally an enzyme substrate. Significant quantities of chemically modified ribozyme are detected in cardiac tissue following this dosing regimen.

Example 6: HBV

Chronic hepatitis B is caused by an enveloped virus, commonly known as the hepatitis B virus or HBV. HBV is transmitted via infected blood or other body fluids, especially saliva and semen, during delivery, sexual activity, or sharing of needles contaminated by infected blood. Individuals may be "carriers" and transmit the infection to others without ever having experienced symptoms of the disease. Persons at highest

risk are those with multiple sex partners, those with a history of sexually transmitted diseases, parenteral drug users, infants born to infected mothers, "close" contacts or sexual partners of infected persons, and healthcare personnel or other service employees who have contact with blood. Transmission is also possible via tattooing, ear or body piercing, and acupuncture; the virus is also stable on razors, toothbrushes, baby bottles, eating utensils, and some hospital equipment such as respirators, scopes and instruments. There is no evidence that HBsAg positive food handlers pose a health risk in an occupational setting, nor should they be excluded from work. Hepatitis B has never been documented as being a food-borne disease. The average incubation period is 60 to 90 days, with a range of 45 to 180; the number of days appears to be related to the amount of virus to which the person was exposed. However, determining the length of incubation is difficult, since onset of symptoms is insidious. Approximately 50% of patients develop symptoms of acute hepatitis that last from 1 to 4 weeks. Two percent or less of these individuals develop fulminant hepatitis resulting in liver failure and death.

The determinants of severity include: (1) The size of the dose to which the person was exposed; (2) the person's age with younger patients experiencing a milder form of the disease; (3) the status of the immune system with those who are immunosuppressed experiencing milder cases; and (4) the presence or absence of co-infection with the Delta virus (hepatitis D), with more severe cases resulting from co-infection. In symptomatic cases, clinical signs include loss of appetite, nausea, vomiting, abdominal pain in the right upper quadrant, arthralgia, and tiredness/loss of energy. Jaundice is not experienced in all cases, however, jaundice is more likely to occur if the infection is due to transfusion or percutaneous serum transfer, and it is accompanied by mild pruritus in some patients. Bilirubin elevations are demonstrated in dark urine and clay-colored stools, and liver enlargement may occur accompanied by right upper-quadrant pain. The acute phase of the disease may be accompanied by severe depression, meningitis, Guillain-Barré syndrome, myelitis, encephalitis, agranulocytosis, and/or thrombocytopenia.

Hepatitis B is generally self-limiting and will resolve in approximately 6 months. Asymptomatic cases can be detected by serologic testing, since the presence of the virus leads to production of large amounts of HBsAg in the blood. This antigen is the first and most useful diagnostic marker for active infections. However, if HBsAg remains positive for 20 weeks or longer, the person is likely to remain positive indefinitely and is now a

carrier. While only 10% of persons over age 6 who contract HBV become carriers, 90% of infants infected during the first year of life do so.

Hepatitis B virus (HBV) infects over 300 million people worldwide (Imperial, 1999, *Gastroenterol. Hepatol.*, 14 (suppl), S1-5). In the United States approximately 1.25 million individuals are chronic carriers of HBV as evidenced by the fact that they have measurable hepatitis B virus surface antigen HBsAg in their blood. The risk of becoming a chronic HBsAg carrier is dependent upon the mode of acquisition of infection as well as the age of the individual at the time of infection. For those individuals with high levels of viral replication, chronic active hepatitis with progression to cirrhosis, liver failure and hepatocellular carcinoma (HCC) is common, and liver transplantation is the only treatment option for patients with end-stage liver disease from HBV.

The natural progression of chronic HBV infection over a 10 to 20 year period leads to cirrhosis in 20-to-50% of patients and progression of HBV infection to hepatocellular carcinoma has been well documented. There have been no studies that have determined sub-populations that are most likely to progress to cirrhosis and/or hepatocellular carcinoma, thus all patients have equal risk of progression.

It is important to note that the survival for patients diagnosed with hepatocellular carcinoma is only 0.9 to 12.8 months from initial diagnosis (Takahashi *et al.*, 1993, *American Journal of Gastroenterology*, 88, 240-243). Treatment of hepatocellular carcinoma with chemotherapeutic agents has not proven effective and only 10% of patients will benefit from surgery due to extensive tumor invasion of the liver (Trinchet *et al.*, 1994, *Presse Medicine*, 23, 831-833). Given the aggressive nature of primary hepatocellular carcinoma, the only viable treatment alternative to surgery is liver transplantation (Pichlmayr *et al.*, 1994, *Hepatology.*, 20, 33S-40S).

Upon progression to cirrhosis, patients with chronic HCV infection present with clinical features, which are common to clinical cirrhosis regardless of the initial cause (D'Amico *et al.*, 1986, *Digestive Diseases and Sciences*, 31, 468-475). These clinical features may include: bleeding esophageal varices, ascites, jaundice, and encephalopathy (Zakim D, Boyer TD. *Hepatology a textbook of liver disease*, Second Edition Volume 1. 1990 W.B. Saunders Company. Philadelphia). In the early stages of cirrhosis, patients are classified as compensated, meaning that although liver tissue damage has occurred, the patient's liver is still able to detoxify metabolites in the blood-stream. In addition, most

patients with compensated liver disease are asymptomatic and the minority with symptoms report only minor symptoms such as dyspepsia and weakness. In the later stages of cirrhosis, patients are classified as decompensated meaning that their ability to detoxify metabolites in the bloodstream is diminished and it is at this stage that the clinical features described above will present.

In 1986, D'Amico *et al.* described the clinical manifestations and survival rates in 1155 patients with both alcoholic and viral associated cirrhosis (D'Amico *supra*). Of the 1155 patients, 435 (37%) had compensated disease although 70% were asymptomatic at the beginning of the study. The remaining 720 patients (63%) had decompensated liver disease with 78% presenting with a history of ascites, 31% with jaundice, 17% had bleeding and 16% had encephalopathy. Hepatocellular carcinoma was observed in six (0.5%) patients with compensated disease and in 30 (2.6%) patients with decompensated disease.

Over the course of six years, the patients with compensated cirrhosis developed clinical features of decompensated disease at a rate of 10% per year. In most cases, ascites was the first presentation of decompensation. In addition, hepatocellular carcinoma developed in 59 patients who initially presented with compensated disease by the end of the six-year study.

With respect to survival, the D'Amico study indicated that the five-year survival rate for all patients on the study was only 40%. The six-year survival rate for the patients who initially had compensated cirrhosis was 54% while the six-year survival rate for patients who initially presented with decompensated disease was only 21%. There were no significant differences in the survival rates between the patients who had alcoholic cirrhosis and the patients with viral related cirrhosis. The major causes of death for the patients in the D'Amico study were liver failure in 49%; hepatocellular carcinoma in 22%; and, bleeding in 13% (D'Amico *supra*).

Hepatitis B virus is a double-stranded circular DNA virus. It is a member of the Hepadnaviridae family. The virus consists of a central core that contains a core antigen (HBcAg) surrounded by an envelope containing a surface protein/surface antigen (HBsAg) and is 42 nm in diameter. It also contains an e antigen (HBeAg) which, along with HBcAg and HBsAg, is helpful in identifying this disease

In HBV virions, the genome is found in an incomplete double-stranded form. HBV uses a reverse transcriptase to transcribe a positive-sense full length RNA version of its genome back into DNA. This reverse transcriptase also contains DNA polymerase activity and thus begins replicating the newly synthesized minus-sense DNA strand. However, it appears that the core protein encapsidates the reverse-transcriptase/polymerase before it completes replication.

From the free-floating form, the virus must first attach itself specifically to a host cell membrane. Viral attachment is one of the crucial steps which determines host and tissue specificity. However, currently there are no in vitro cell-lines that can be infected by HBV. There are some cells lines, such as HepG2, which can support viral replication only upon transient or stable transfection using HBV DNA.

After attachment, fusion of the viral envelope and host membrane must occur to allow the viral core proteins containing the genome and polymerase to enter the cell. Once inside, the genome is translocated to the nucleus where it is repaired and cyclized.

The complete closed circular DNA genome of HBV remains in the nucleus and gives rise to four transcripts. These transcripts initiate at unique sites but share the same 3'-ends. The 3.5-kb pregenomic RNA serves as a template for reverse transcription and also encodes the nucleocapsid protein and polymerase. A subclass of this transcript with a 5'-end extension codes for the precore protein that, after processing, is secreted as HBV e antigen. The 2.4-kb RNA encompasses the pre-S1 open reading frame (ORF) that encodes the large surface protein. The 2.1-kb RNA encompasses the pre-S2 and S ORFs that encode the middle and small surface proteins, respectively. The smallest transcript (~0.8-kb) codes for the X protein, a transcriptional activator.

Multiplication of the HBV genome begins within the nucleus of an infected cell. RNA polymerase II transcribes the circular HBV DNA into greater-than-full length mRNA. Since the mRNA is longer than the actual complete circular DNA, redundant ends are formed. Once produced, the pregenomic RNA exits the nucleus and enters the cytoplasm.

The packaging of pregenomic RNA into core particles is triggered by the binding of the HBV polymerase to the 5' epsilon stem-loop. RNA encapsidation is believed to occur as soon as binding occurs. The HBV polymerase also appears to require associated core protein in order to function. The HBV polymerase initiates reverse transcription from the

5' epsilon stem-loop three to four base pairs at which point the polymerase and attached nascent DNA are transferred to the 3' copy of the DR1 region. Once there, the (-)DNA is extended by the HBV polymerase while the RNA template is degraded by the HBV polymerase RNAse H activity. When the HBV polymerase reaches the 5' end, a small stretch of RNA is left undigested by the RNAse H activity. This segment of RNA is comprised of a small sequence just upstream and including the DR1 region. The RNA oligomer is then translocated and annealed to the DR2 region at the 5' end of the (-)DNA. It is used as a primer for the (+)DNA synthesis which is also generated by the HBV polymerase. It appears that the reverse transcription as well as plus strand synthesis may occur in the completed core particle.

Since the pregenomic RNA is required as a template for DNA synthesis, this RNA is an excellent target for ribozyme cleavage. Nucleoside analogues that have been documented to inhibit HBV replication target the reverse transcriptase activity needed to convert the pregenomic RNA into DNA. Ribozyme cleavage of the pregenomic RNA template would be expected to result in a similar inhibition of HBV replication. Further, targeting the 3'-end of the pregenomic RNA that is common to all HBV transcripts could result in reduction of all HBV gene products and an additional level of inhibition of HBV replication.

As previously mentioned, HBV does not infect cells in culture. However, transfection of HBV DNA (either as a head-to-tail dimer or as an "overlength" genome of >100%) into HuH7 or Hep G2 hepatocytes results in viral gene expression and production of HBV virions released into the media. Thus, HBV replication competent DNA would be co-transfected with ribozymes in cell culture. Such an approach has been used to report intracellular ribozyme activity against HBV (zu Putlitz, *et al.*, 1999, *J. Virol.*, 73, 5381-5387, and Kim *et al.*, 1999, *Biochem. Biophys. Res. Commun.*, 257, 759-765). In addition, stable hepatocyte cell lines have been generated that express HBV. In these cells only ribozyme would need to be delivered; however, a delivery screen would need to be performed. In addition, stable hepatocyte cell lines have been generated that express HBV.

Intracellular HBV gene expression can be assayed by a Taqman® assay for HBV RNA or by ELISA for HBV protein. Extracellular virus can be assayed by PCR for DNA or ELISA for protein. Antibodies are commercially available for HBV surface antigen and

core protein. A secreted alkaline phosphatase expression plasmid can be used to normalize for differences in transfection efficiency and sample recovery.

There are several small animal models to study HBV replication. One is the transplantation of HBV-infected liver tissue into irradiated mice. Viremia (as evidenced by measuring HBV DNA by PCR) is first detected 8 days after transplantation and peaks between 18 – 25 days (Ilan *et al.*, 1999, *Hepatology*, 29, 553-562).

Transgenic mice that express HBV have also been used as a model to evaluate potential anti-virals. HBV DNA is detectable in both liver and serum (Morrey *et al.*, 1999, *Antiviral Res.*, 42, 97-108).

An additional model is to establish subcutaneous tumors in nude mice with Hep G2 cells transfected with HBV. Tumors develop in about 2 weeks after inoculation and express HBV surface and core antigens. HBV DNA and surface antigen is also detected in the circulation of tumor-bearing mice (Yao *et al.*, 1996, *J. Viral Hepat.*, 3, 19-22).

Woodchuck hepatitis virus (WHV) is closely related to HBV in its virus structure, genetic organization, and mechanism of replication. As with HBV in humans, persistent WHV infection is common in natural woodchuck populations and is associated with chronic hepatitis and hepatocellular carcinoma (HCC). Experimental studies have established that WHV causes HCC in woodchucks and woodchucks chronically infected with WHV have been used as a model to test a number of anti-viral agents. For example, the nucleoside analogue 3T3 was observed to cause dose dependent reduction in virus (50% reduction after two daily treatments at the highest dose) (Hurwitz *et al.*, 1998. *Antimicrob. Agents Chemother.*, 42, 2804-2809).

Current therapeutic goals of treatment are three-fold: to eliminate infectivity and transmission of HBV to others, to arrest the progression of liver disease and improve the clinical prognosis, and to prevent the development of hepatocellular carcinoma (HCC).

Interferon alpha use is the most common therapy for HBV; however, recently Lamivudine (3TC) has been approved by the FDA. Interferon alpha (IFN-alpha) is one treatment for chronic hepatitis B. The standard duration of IFN-alpha therapy is 16 weeks, however, the optimal treatment length is still poorly defined. A complete response (HBV DNA negative HBeAg negative) occurs in approximately 25% of patients. Several factors have been identified that predict a favorable response to therapy including: High ALT , low HBV DNA , being female, and heterosexual orientation.

There is also a risk of reactivation of the hepatitis B virus even after a successful response, this occurs in around 5% of responders and normally occurs within 1 year.

Side effects resulting from treatment with type 1 interferons can be divided into four general categories including: Influenza-like symptoms, neuropsychiatric, laboratory abnormalities, and other miscellaneous side effects. Examples of influenza-like symptoms include, fatigue, fever; myalgia, malaise, appetite loss, tachycardia, rigors, headache and arthralgias. The influenza-like symptoms are usually short-lived and tend to abate after the first four weeks of dosing (Dusheiko *et al.,* 1994, *Journal of Viral Hepatitis,* 1, 3-5). Neuropsychiatric side effects include irritability, apathy, mood changes, insomnia, cognitive changes, and depression. Laboratory abnormalities include the reduction of myeloid cells, including granulocytes, platelets and to a lesser extent, red blood cells. These changes in blood cell counts rarely lead to any significant clinical sequellae. In addition, increases in triglyceride concentrations and elevations in serum alaine and aspartate aminotransferase concentration have been observed. Finally, thyroid abnormalities have been reported. These thyroid abnormalities are usually reversible after cessation of interferon therapy and can be controlled with appropriate medication while on therapy. Miscellaneous side effects include nausea, diarrhea, abdominal and back pain, pruritus, alopecia, and rhinorrhea. In general, most side effects will abate after 4 to 8 weeks of therapy (Dushieko *et al., supra*).

Lamivudine (3TC) is a nucleoside analogue, which is a very potent and specific inhibitor of HBV DNA synthesis. Lamivudine has recently been approved for the treatment of chronic Hepatitis B. Unlike treatment with interferon, treatment with 3TC does not eliminate the HBV from the patient. Rather, viral replication is controlled and chronic administration results in improvements in liver histology in over 50% of patients. Phase III studies with 3TC, showed that treatment for one year was associated with reduced liver inflammation and a delay in scarring of the liver. In addition, patients treated with Lamivudine (100mg per day) had a 98 percent reduction in hepatitis B DNA and a significantly higher rate of seroconversion, suggesting disease improvements after completion of therapy. However, stopping of therapy resulted in a reactivation of HBV replication in most patients. In addition recent reports have documented 3TC resistance in approximately 30% of patients.

Particular degenerative and disease states that can be associated with HBV expression modulation include but are not limited to, HBV infection, hepatitis, cancer, tumorigenesis, cirrhosis, liver failure and others.

Lamivudine (3TC), L-FMAU, adefovir dipivoxil, type 1 Interferon, therapeutic vaccines, steriods, and 2'-5' Oligoadenylates are non-limiting examples of pharmaceutical agents that can be combined with or used in conjunction with the nucleic acid molecules (*e.g.* ribozymes and antisense molecules) of the instant invention. Those skilled in the art will recognize that other drugs such as diuretic and antihypertensive compounds or other therapies can similarly and readily be combined with the nucleic acid molecules of the instant invention (*e.g.* ribozymes and antisense molecules) and are, therefore, within the scope of the instant invention.

Current therapies for treating HBV infection, including interferon and nucleoside analogues, are only partially effective. In addition, drug resistance to nucleoside analogues is now emerging, making treatment of chronic Hepatitis B more difficult. Thus, a need exists for effective treatment of this disease which utilizes antiviral inhibitors which work by mechanisms other than those currently utilized in the treatment of both acute and chronic hepatitis B infections.

Draper, US patent No. 6,017,756, describes the use of ribozymes for the inhibition of Hepatitis B Virus.

Passman *et al.*, 2000, *Biochem. Biophys. Res. Commun.*, 268(3), 728-733.; Gan *et al.*, 1998, *J. Med. Coll. PLA*, 13(3), 157-159.; Li *et al.*, 1999, *Jiefangjun Yixue Zazhi*, 24(2), 99-101.; Putlitz *et al.*, 1999, *J. Virol.*, 73(7), 5381-5387.; Kim *et al.*, 1999, *Biochem. Biophys. Res. Commun.*, 257(3), 759-765.; Xu *et al.*, 1998, *Bingdu Xuebao*, 14(4), 365-369.; Welch *et al.*, 1997, *Gene Ther.*, 4(7), 736-743.; Goldenberg *et al.*, 1997, International PCT publication No. WO 97/08309, Wands *et al.*, 1997, *J. of Gastroenterology and Hepatology*, 12(suppl.), S354-S369.; Ruiz *et al.*, 1997, *BioTechniques*, 22(2), 338-345.; Gan *et al.*, 1996, *J. Med. Coll. PLA*, 11(3), 171-175.; Beck and Nassal, 1995, *Nucleic Acids Res.*, 23(24), 4954-62.; Goldenberg, 1995, International PCT publication No. WO 95/22600.; Xu *et al.*, 1993, *Bingdu Xuebao*, 9(4), 331-6.; Wang *et al.*, 1993, *Bingdu Xuebao*, 9(3), 278-80, all describe ribozymes that are targeted to cleave a specific HBV target site.

The enzymatic nucleic acid molecules of the instant invention exhibit a high degree of specificity for only the viral mRNA in infected cells. Nucleic acid molecules of the instant invention targeted to highly conserved sequence regions allow the treatment of many strains of human HBV with a single compound. No treatment presently exists which specifically attacks expression of the viral gene(s) that are responsible for transformation of hepatocytes by HBV.

The methods of this invention can be used to treat human hepatitis B virus infections, which include productive virus infection, latent or persistent virus infection, and HBV-induced hepatocyte transformation. The utility can be extended to other species of HBV which infect non-human animals where such infections are of veterinary importance.

Preferred target sites are genes required for viral replication, a non-limiting example includes genes for protein synthesis, such as the 5' most 1500 nucleotides of the HBV pregenomic mRNAs. For sequence references, see Renbao *et al.*, 1987, *Sci. Sin.*, 30, 507. This region controls the translational expression of the core protein (C), X protein (X) and DNA polymerase (P) genes and plays a role in the replication of the viral DNA by serving as a template for reverse transcriptase. Disruption of this region in the RNA results in deficient protein synthesis as well as incomplete DNA synthesis (and inhibition of transcription from the defective genomes). Target sequences 5' of the encapsidation site can result in the inclusion of the disrupted 3' RNA within the core virion structure and targeting sequences 3' of the encapsidation site can result in the reduction in protein expression from both the 3' and 5' fragments.

Alternative regions outside of the 5' most 1500 nucleotides of the pregenomic mRNA also make suitable targets of enzymatic nucleic acid mediated inhibition of HBV replication. Such targets include the mRNA regions that encode the viral S gene. Selection of particular target regions will depend upon the secondary structure of the pregenomic mRNA. Targets in the minor mRNAs can also be used, especially when folding or accessibility assays in these other RNAs reveal additional target sequences that are unavailable in the pregenomic mRNA species.

A desirable target in the pregenomic RNA is a proposed bipartite stem-loop structure in the 3'-end of the pregenomic RNA which is believed to be critical for viral replication (Kidd and Kidd-Ljunggren, 1996. *Nuc. Acid Res.* 24:3295-3302). The 5'end of the HBV

pregenomic RNA carries a *cis*-acting encapsidation signal, which has inverted repeat sequences that are thought to form a bipartite stem-loop structure. Due to a terminal redundancy in the pregenomic RNA, the putative stem-loop also occurs at the 3'-end. While it is the 5' copy which functions in polymerase binding and encapsidation, reverse transcription actually begins from the 3' stem-loop. To start reverse transcription, a 4 nt primer which is covalently attached to the polymerase is made, using a bulge in the 5' encapsidation signal as template. This primer is then shifted, by an unknown mechanism, to the DR1 primer binding site in the 3' stem-loop structure, and reverse transcription proceeds from that point. The 3' stem-loop, and especially the DR1 primer binding site, appear to be highly effective targets for ribozyme intervention.

Sequences of the pregenomic RNA are shared by the mRNAs for surface, core, polymerase, and X proteins. Due to the overlapping nature of the HBV transcripts, all share a common 3'-end. Ribozyme targeting this common 3'-end will thus cleave the pregenomic RNA as well as all of the mRNAs for surface, core, polymerase and X proteins.

In preferred embodiments, the invention features a method for the analysis of HBV proteins. This method is useful in determining the efficacy of HBV inhibitors. Specifically, the instant invention features an assay for the analysis of HBsAg proteins and secreted alkaline phosphatase (SEAP) control proteins to determine the efficacy of agents used to modulate HBV expression.

The method consists of coating a micro-titer plate with an antibody such as anti-HBsAg Mab (for example, Biostride B88-95-31ad,ay) at 0.1 to 10 µg/ml in a buffer (for example, carbonate buffer, such as Na_2CO_3 15 mM, $NaHCO_3$ 35 mM, pH 9.5) at 4°C overnight. The microtiter wells are then washed with PBST or the equivalent thereof, (for example, PBS, 0.05% Tween 20) and blocked for 0.1-24 hr at 37° C with PBST, 1% BSA or the equivalent thereof. Following washing as above, the wells are dried (for example, at 37° C for 30 min). Biotinylated goat anti-HBsAg or an equivalent antibody (for example, Accurate YVS1807) is diluted (for example at 1:1000) in PBST and incubated in the wells (for example, 1 hr. at 37° C). The wells are washed with PBST (for example, 4x). A conjugate, (for example, Streptavidin/Alkaline Phosphatase Conjugate, Pierce 21324) is diluted to 10-10,000 ng/ml in PBST, and incubated in the wells (for example, 1 hr. at 37° C). After washing as above, a substrate (for example, p-nitrophenyl phosphate substrate,

Pierce 37620) is added to the wells, which are then incubated (for example, 1 hr. at 37° C). The optical density is then determined (for example, at 405 nm). SEAP levels are then assayed, for example, using the Great EscAPe® Detection Kit (Clontech K2041-1), as per the manufacturers instructions. In the above example, incubation times and reagent concentrations may be varied to achieve optimum results, a non-limiting example is described in Example 6.

Comparison of this HBsAg ELISA method to a commercially available assay from World Diagnostics, Inc. 15271 NW 60th Ave, #201, Miami Lakes, FL 33014 (305) 827-3304 (Cat. No. EL10018) demonstrates an increase in sensitivity (signal:noise) of 3-20 fold.

Identification of Potential Target Sites in Human HBV RNA

The sequence of human HBV was screened for accessible sites using a computer-folding algorithm. Regions of the RNA that did not form secondary folding structures and contained potential ribozyme and/or antisense binding/cleavage sites were identified. The sequences of these cleavage sites are shown in **Tables 36-43.**

Selection of Enzymatic Nucleic Acid Cleavage Sites in Human HBV RNA

Ribozyme target sites were chosen by analyzing sequences of Human HBV (accession number: AF100308.1) and prioritizing the sites on the basis of folding. Ribozymes were designed that could bind each target and were individually analyzed by computer folding (Christoffersen *et al.,* 1994 *J. Mol. Struc. Theochem,* 311, 273; Jaeger *et al.*, 1989, *Proc. Natl. Acad. Sci. USA*, **86**, 7706) to assess whether the ribozyme sequences fold into the appropriate secondary structure. Those ribozymes with unfavorable intramolecular interactions between the binding arms and the catalytic core were eliminated from consideration. As noted herein, varying binding arm lengths can be chosen to optimize activity. Generally, at least 5 bases on each arm are able to bind to, or otherwise interact with, the target RNA.

Chemical Synthesis and Purification of Ribozymes and Antisense for Efficient Cleavage and/or blocking of HBV RNA

Ribozymes and antisense constructs were designed to anneal to various sites in the RNA message. The binding arms of the ribozymes are complementary to the target site sequences described above, while the antisense constructs are fully complementary to the target site sequences described above. The ribozymes and antisense constructs were chemically synthesized. The method of synthesis used followed the procedure for normal RNA synthesis as described above and in Usman et al., (1987 *J. Am. Chem. Soc.*, 109, 7845), Scaringe et al., (1990 *Nucleic Acids Res.*, 18, 5433) and Wincott et al., *supra*, and made use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The average stepwise coupling yields were typically >98%.

Ribozymes and antisense constructs were also synthesized from DNA templates using bacteriophage T7 RNA polymerase (Milligan and Uhlenbeck, 1989, *Methods Enzymol.* 180, 51). Ribozymes and antisense constructs were purified by gel electrophoresis using general methods or were purified by high pressure liquid chromatography (HPLC; see Wincott et al., *supra*; the totality of which is hereby incorporated herein by reference) and were resuspended in water. The sequences of the chemically synthesized ribozymes used in this study are shown below in **Table 43.**

Ribozyme Cleavage of HBV RNA Target *in vitro*

Ribozymes targeted to the human HBV RNA are designed and synthesized as described above. These ribozymes can be tested for cleavage activity *in vitro*, for example using the following procedure. The target sequences and the nucleotide location within the HBV RNA are given in **Tables 36-43.**

Cleavage Reactions: Full-length or partially full-length, internally-labeled target RNA for ribozyme cleavage assay is prepared by *in vitro* transcription in the presence of [α-^{32}P] CTP, passed over a G 50 Sephadex® column by spin chromatography and used as substrate RNA without further purification. Alternately, substrates are 5'-^{32}P-end labeled using T4 polynucleotide kinase enzyme. Assays are performed by pre-warming a 2X concentration of purified ribozyme in ribozyme cleavage buffer (50 mM Tris-HCl, pH 7.5

at 37°C, 10 mM $MgCl_2$) and the cleavage reaction was initiated by adding the 2X ribozyme mix to an equal volume of substrate RNA (maximum of 1-5 nM) that was also pre-warmed in cleavage buffer. As an initial screen, assays are carried out for 1 hour at 37°C using a final concentration of either 40 nM or 1 mM ribozyme, *i.e.*, ribozyme excess. The reaction is quenched by the addition of an equal volume of 95% formamide, 20 mM EDTA, 0.05% bromophenol blue and 0.05% xylene cyanol after which the sample is heated to 95°C for 2 minutes, quick chilled and loaded onto a denaturing polyacrylamide gel. Substrate RNA and the specific RNA cleavage products generated by ribozyme cleavage are visualized on an autoradiograph of the gel. The percentage of cleavage is determined by Phosphor Imager® quantitation of bands representing the intact substrate and the cleavage products.

Transfection of HepG2 Cells with psHBV-1 and Ribozymes

The human hepatocellular carcinoma cell line Hep G2 was grown in Dulbecco's modified Eagle media supplemented with 10% fetal calf serum, 2 mM glutamine, 0.1 mM nonessential amino acids, 1 mM sodium pyruvate, 25 mM Hepes, 100 units penicillin, and 100 μg/ml streptomycin. To generate a replication competent cDNA, prior to transfection the HBV genomic sequences are excised from the bacterial plasmid sequence contained in the psHBV-1 vector (Those skilled in the art understand that other methods may be used to generate a replication competent cDNA). This was done with an EcoRI and Hind III restriction digest. Following completion of the digest, a ligation was performed under dilute conditions (20 μg/ml) to favor intermolecular ligation. The total ligation mixture was then concentrated using Qiagen spin columns.

Secreted alkaline phosphatase (SEAP) was used to normalize the HBsAg levels to control for transfection variability. The pSEAP2-TK control vector was constructed by ligating a Bgl II-Hind III fragment of the pRL-TK vector (Promega), containing the herpes simplex virus thymidine kinase promoter region, into *Bgl* II/*Hind* III digested pSEAP2-Basic (Clontech). Hep G2 cells were plated (3×10^4 cells/well) in 96-well microtiter plates and incubated overnight. A lipid/DNA/ribozyme complex was formed containing (at final concentrations) cationic lipid (15 μg/ml), prepared psHBV-1 (4.5 μg/ml), pSEAP2-TK (0.5 μg/ml), and ribozyme (100 μM). Following a 15 min. incubation at 37° C, the

complexes were added to the plated Hep G2 cells. Media was removed from the cells 96 hr. post-transfection for HBsAg and SEAP analysis.

Transfection of the human hepatocellular carcinoma cell line, Hep G2, with replication competent HBV DNA results in the expression of HBV proteins and the production of virions. To investigate the potential use of ribozymes for the treatment of chronic HBV infection, a series of ribozymes that target the 3' terminus of the HBV genome have been synthesized. Ribozymes targeting this region have the potential to cleave all four major HBV RNA transcripts as well as the potential to block the production of HBV DNA by cleavage of the pregenomic RNA. To test the efficacy of these HBV ribozymes, they were co-transfected with HBV genomic DNA into Hep G2 cells, and the subsequent levels of secreted HBV surface antigen (HBsAg) were analyzed by ELISA. To control for variability in transfection efficiency, a control vector which expresses secreted alkaline phosphatase (SEAP), was also co-transfected. The efficacy of the HBV ribozymes was determined by comparing the ratio of HBsAg:SEAP and/or HBeAg:SEAP to that of a scrambled attenuated control (SAC) ribozyme. Twenty-five ribozymes (RPI18341, RPI18356, RPI18363, RPI18364, RPI18365, RPI18366, RPI18367, RPI18368, RPI18369, RPI18370, RPI18371, RPI18372, RPI18373, RPI18374, RPI18303, RPI18405, RPI18406, RPI18407, RPI18408, RPI18409, RPI18410, RPI18411, RPI18418, RPI18419, and RPI18422) have been identified which cause a reduction in the levels of HBsAg and/or HBeAg as compared to the corresponding SAC ribozyme.

Example 6: Analysis of HBsAg and SEAP Levels Following Ribozyme Treatment

Immulon 4 (Dynax) microtiter wells were coated overnight at 4° C with anti-HBsAg Mab (Biostride B88-95-31ad,ay) at 1 μg/ml in Carbonate Buffer (Na_2CO_3 15 mM, $NaHCO_3$ 35 mM, pH 9.5). The wells were then washed 4x with PBST (PBS, 0.05% Tween® 20) and blocked for 1 hr at 37° C with PBST, 1% BSA. Following washing as above, the wells were dried at 37° C for 30 min. Biotinylated goat ant-HBsAg (Accurate YVS1807) was diluted 1:1000 in PBST and incubated in the wells for 1 hr. at 37° C. The wells were washed 4x with PBST. Streptavidin/Alkaline Phosphatase Conjugate (Pierce 21324) was diluted to 250 ng/ml in PBST, and incubated in the wells for 1 hr. at 37° C. After washing as above, p-nitrophenyl phosphate substrate (Pierce 37620) was added to the wells, which were then incubated for 1 hr. at 37° C. The optical density at 405 nm was

then determined. SEAP levels were assayed using the Great EscAPe® Detection Kit (Clontech K2041-1), as per the manufacturers instructions.

Example 7: X-gene Reporter Assay

The effect of ribozyme treatment on the level of transactivation of a SV40 promoter driven firefly luciferase gene by the HBV X-protein was analyzed in transfected Hep G2 cells. As a control for variability in transfection efficiency, a Renilla luciferase reporter driven by the TK promoter, which is not transactivated by the X protein, was used. Hep G2 cells were plated (3×10^4 cells/well) in 96-well microtiter plates and incubated overnight. A lipid/DNA/ribozyme complex was formed containing (at final concentrations) cationic lipid (2.4 μg/ml), the X-gene vector pSBDR(2.5 μg/ml), the firefly reporter pSV40HCVluc (0.5 μg/ml), the Renilla luciferase control vector pRL-TK (0.5 μg/ml), and ribozyme (100 μM). Following a 15 min. incubation at 37° C, the complexes were added to the plated Hep G2 cells. Levels of firefly and Renilla luciferase were analyzed 48 hr. post transfection, using Promega's Dual-Luciferase Assay System.

The HBV X protein is a transactivator of a number of viral and cellular genes. Ribozymes which target the X region were tested for their ability to cause a reduction in X protein transactivation of a firefly luciferase gene driven by the SV40 promoter in transfected Hep G2 cells. As a control for transfection variability, a vector containing the Renilla luciferase gene driven by the TK promotor, which is not activated by the X protein, was included in the co-transfections. The efficacy of the HBV ribozymes was determined by comparing the ratio of firefly luciferase: Renilla luciferase to that of a scrambled attenuated control (SAC) ribozyme. Eleven ribozymes (RPI18365, RPI18367, RPI18368, RPI18371, RPI18372, RPI18373, RPI18405, RPI18406, RPI18411, RPI18418, RPI18423) were identified which cause a reduction in the level of transactivation of a reporter gene by the X protein, as compared to the corresponding SAC ribozyme.

Example 8: HBV transgenic mouse study

A transgenic mouse strain (founder strain 1.3.32 with a C57B1/6 background) that expresses HBV RNA and forms HBV viremia (Morrey *et al.*, 1999, *Antiviral Res.*, 42, 97-108; Guidotti *et al.*, 1995, *J. Virology*, 69, 10, 6158-6169) was utilized to study the *in vivo*

activity of ribozymes of the instant invention. This model is predictive in screening for anti-HBV agents. Ribozyme or the equivalent volume of saline was administered via a continuous s.c. infusion using Alzet® mini-osmotic pumps for 14 days. Alzet® pumps were filled with test material(s) in a sterile fashion according to the manufacturer's instructions. Prior to *in vivo* implantation, pumps were incubated at 37°C overnight ($\geq$ 18 hours) to prime the flow modulators. On the day of surgery, animals were lightly anesthetized with a ketamine/xylazine cocktail (94 mg/kg and 6 mg/kg, respectively; 0.3 ml, IP). Baseline blood samples (200 μl) were obtained from each animal *via* a retro-orbital bleed. A 2 cm area near the base of the tail was shaved and cleansed with betadine surgical scrub and sequentially with 70% alcohol. A 1 cm incision in the skin was made with a #15 scalpel blade or a blunt pair of scissors near the base of the tail. Forceps were used to open a pocket rostrally (*i.e.*, towards the head) by spreading apart the subcutaneous connective tissue. The pump was inserted with the delivery portal pointing away from the incision. Wounds were closed with sterile 9-mm stainless steel clips or with sterile 4-0 suture. Animals were then allowed to recover from anesthesia on a warm heating pad before being returned to their cage. Wounds were checked daily. Clips or sutures were replaced as needed. Incisions typically healed completely within 7 days post-op. Animals were then deeply anesthetized with the ketamine/xylazine cocktail (150 mg/kg and 10 mg/kg, respectively; 0.5 ml, IP) on day 14 post pump implantation. A midline thoracotomy/ laparatomy was performed to expose the abdominal cavity and the thoracic cavity. The left ventricle was cannulated at the base and animals exsanguinated using a 23G needle and 1 ml syringe. Serum was separated, frozen and analyzed for HBV DNA and antigen levels. Experimental groups were compared to the saline control group in respect to percent change from day 0 to day 14. HBV DNA was assayed by quantitative PCR

<u>Results</u>

Table 44 is a summary of the group designation and dosage levels used in the HBV transgenic mouse study. Baseline blood samples were obtained *via* a retroorbital bleed and animals (N=10/group) received anti-HBV ribozymes (100 mg/kg/day) as a continuous SC infusion. After 14 days, animals treated with a ribozyme targeting site 273 (RPI.18341) of

the HBV RNA showed a significant reduction in serum HBV DNA concentration, compared to the saline treated animals as measured by a quantitative PCR assay. More specifically, the saline treated animals had a 69% increase in serum HBV DNA concentrations over this 2-week period while treatment with the 273 ribozyme (RPI.18341) resulted in a 60% decrease in serum HBV DNA concentrations. Ribozymes directed against sites 1833 (RPI.18371), 1873 (RPI.18418), and 1874 (RPI.18372) decreased serum HBV DNA concentrations by 49%, 15% and 16%, respectively.

Example 7: Activity of NCH Ribozyme to inhibit HER2 gene expression

HER2 (also known as neu, erbB2 and c-erbB2) is an oncogene that encodes a 185-kDa transmembrane tyrosine kinase receptor. HER2 is a member of the epidermal growth factor receptor (EGFR) family and shares partial homology with other family members. In normal adult tissues HER2 expression is low. However, HER2 is overexpressed in at least 25-30% of breast (McGuire & Greene, 1989) and ovarian cancers (Berchuck, *et al.*, 1990). Furthermore, overexpression of HER2 in malignant breast tumors has been correlated with increased metastasis, chemoresistance and poor survival rates (Slamon *et al.*, 1987 *Science* **235**: 177-182). Because HER2 expression is high in aggressive human breast and ovarian cancers, but low in normal adult tissues, it is an attractive target for ribozyme-mediated therapy (Thompson *et al., supra).*

The greatest HER2 specific effects have been observed in cancer cell lines that express high levels of HER2 protein (as measured by ELISA). Specifically, in one study that treated five human breast cancer cell lines with the HER2 antibody (anti-erbB2-sFv), the greatest inhibition of cell growth was seen in three cell lines (MDA-MB-361, SKBR-3 and BT-474) that express high levels of HER2 protein. No inhibition of cell growth was observed in two cell lines (MDA-MB-231 and MCF-7) that express low levels of HER2 protein (Wright *et al.,* 1997). Another group successfully used SKBR-3 cells to show HER2 antisense oligonucleotide-mediated inhibition of HER2 protein expression and HER2 RNA knockdown (Vaughn *et al.*, 1995). Other groups have also demonstrated a decrease in the levels of HER2 protein, HER2 mRNA and/or cell proliferation in cultured cells using anti-HER2 ribozymes or antisense molecules (Suzuki, T. *et al.*, 1997; Weichen, *et al.*, 1997; Czubayko, F. *et al.*, 1997; Colomer, *et al.*, 1994; Betram *et al.*, 1994). Because cell lines that express higher levels of HER2 have been more sensitive to anti-

HER2 agents, we are pursuing several medium to high expressing cell lines, including SKBR-3 and T47D, for ribozyme screens in cell culture.

A variety of endpoints have been used in cell culture models to look at HER2-mediated effects after treatment with anti-HER2 agents. Phenotypic endpoints include inhibition of cell proliferation, apoptosis assays and reduction of HER2 protein expression. Because overexpression of HER2 is directly associated with increased proliferation of breast and ovarian tumor cells, a proliferation endpoint for cell culture assays will be our primary screen. There are several methods by which this endpoint can be measured. Following treatment of cells with ribozymes, cells are allowed to grow (typically 5 days) after which either the cell viability, the incorporation of [^{3}H] thymidine into cellular DNA and/or the cell density can be measured. The assay of cell density is very straightforward and can be done in a 96-well format using commercially available fluorescent nucleic acid stains (such as Syto 13 or CyQuant). The assay using CyQuant is in place at RPI and is currently being employed to screen ~100 ribozymes targeting HER2 (details below).

As a secondary, confirmatory endpoint a ribozyme-mediated decrease in the level of HER2 protein expression can be evaluated using a HER2-specific ELISA.

Validation of Cell Lines and Ribozyme Treatment Conditions

Two human breast cancer cell lines (T47D and SKBR-3) that are known to express medium to high levels of HER2 protein, respectively, were considered for ribozyme screening. In order to validate these cell lines for HER2-mediated sensitivity, both cell lines were treated with the HER2 specific antibody, Herceptin® (Genentech) and its effect on cell proliferation was determined. Herceptin was added to cells at concentrations ranging from 0–8 μM in medium containing either no serum (OptiMem), 0.1% or 0.5% FBS and efficacy was determined *via* cell proliferation. Maximal inhibition of proliferation (~50%) in both cell lines was observed after addition of Herceptin at 0.5 nM in medium containing 0.1% or no FBS. The fact that both cell lines are sensitive to an anti-HER2 agent (Herceptin) supports their use in experiments testing anti-HER2 ribozymes.

Prior to ribozyme screening, the choice of the optimal lipid(s) and conditions for ribozyme delivery was determined empirically for each cell line. Applicant has established a panel of proprietary lipids that can be used to deliver ribozymes to cultured cells and are

very useful for cell proliferation assays that are typically 3-5 days in length. Initially, this panel of proprietary lipid delivery vehicles was screened in SKBR-3 and T47D cells using previously established control oligonucleotides. Specific lipids and conditions for optimal delivery were selected for each cell line based on these screens. These conditions were used to deliver HER2 specific ribozymes to cells for primary (inhibition of cell proliferation) and secondary (decrease in HER2 protein) efficacy endpoints.

Primary Screen: Inhibition of Cell Proliferation

Although optimal ribozyme delivery conditions were determined for two cell lines, the SKBR-3 cell line were be used for the initial screen because it has the higher level of HER2 protein, and thus should be most susceptible to a HER2-specific ribozyme. Follow-up studies can be carried out in T47D cells to confirm leads as necessary.

Ribozyme screens were be performed using an automated, high throughput 96-well cell proliferation assay. Cell proliferation were measured over a 5-day treatment period using the nucleic acid stain CyQuant for determining cell density. The growth of cells treated with ribozyme/lipid complexes were compared to both untreated cells and to cells treated with *S*crambled-arm *A*ttenuated core *C*ontrols (SAC; or IA; **Figure 8**). SACs can no longer bind to the target site due to the scrambled arm sequence and have nucleotide changes in the core that greatly diminish ribozyme cleavage. These SACs are used to determine non-specific inhibition of cell growth caused by ribozyme chemistry (*i.e.* multiple 2' *O*–Me modified nucleotides, a single 2'*C*-allyl uridine, 4 phosphorothioates and a 3' inverted abasic). Lead ribozymes are chosen from the primary screen based on their ability to inhibit cell proliferation in a specific manner. Dose response assays are carried out on these leads and a subset was advanced into a secondary screen using the level of HER2 protein as an endpoint.

Secondary Screen: Decrease in HER2 Protein

A secondary screen that measures the effect of anti-HER2 ribozymes on HER2 protein levels is used to support preliminary findings. A robust HER2 ELISA for both T47D and SKBR-3 cells has been established and is available for use as an additional endpoint.

Ribozyme Mechanism Assays

A Taqman assay for measuring the ribozyme-mediated decrease in HER2 RNA has also been established. This assay is based on PCR technology and can measure in real time the production of HER2 mRNA relative to a standard cellular mRNA such as GAPDH. This RNA assay is used to establish proof that lead ribozymes are working through an RNA cleavage mechanism and result in a decrease in the level of HER2 mRNA, thus leading to a decrease in cell surface HER2 protein receptors and a subsequent decrease in tumor cell proliferation.

Animal Models

Evaluating the efficacy of anti-HER2 agents in animal models is an important prerequisite to human clinical trials. As in cell culture models, the most HER2 sensitive mouse tumor xenografts are those derived from human breast carcinoma cells that express high levels of HER2 protein. In a recent study, nude mice bearing BT-474 xenografts were sensitive to the anti-HER2 humanized monoclonal antibody Herceptin, resulting in an 80% inhibition of tumor growth at a 1 mg kg dose (ip, 2 X week for 4-5 weeks). Tumor eradication was observed in 3 of 8 mice treated in this manner (Baselga *et al.*, 1998). This same study compared the efficacy of Herceptin alone or in combination with the commonly used chemotherapeutics, paclitaxel or doxorubicin. Although, all three anti-HER2 agents caused modest inhibition of tumor growth, the greatest antitumor activity was produced by the combination of Herceptin and paclitaxel (93% inhibition of tumor growth *vs* 35% with paclitaxel alone). The above studies provide proof that inhibition of HER2 expression by anti-HER2 agents causes inhibition of tumor growth in animals. Lead anti-HER2 ribozymes chosen from *in vitro* assays are further tested in mouse xenograft models. Ribozymes are first tested alone and then in combination with standard chemotherapies.

Animal Model Development

Three human breast tumor cell lines (T47D, SKBR-3 and BT-474) were characterized to establish their growth curves in mice. These three cell lines have been implanted into the mammary papillae of both nude and SCID mice and primary tumor volumes are measured 3 times per week. Growth characteristics of these tumor lines using

a Matrigel implantation format will also be established. In addition, the use of two other breast cell lines that have been engineered to express high levels of HER2 are also being used. The tumor cell line(s) and implantation method that supports the most consistent and reliable tumor growth is used in animal studies testing the lead HER2 ribozyme(s). Ribozyme are administered by daily subcutaneous injection or by continuous subcutaneous infusion from Alzet mini osmotic pumps beginning 3 days after tumor implantation and continuing for the duration of the study. Group sizes of at least 10 animals are employed. Efficacy is determined by statistical comparison of tumor volume of ribozyme-treated animals to a control group of animals treated with saline alone. Because the growth of these tumors is generally slow (45-60 days), an initial endpoint will be the time in days it takes to establish an easily measurable primary tumor (i.e. 50-100 mm^3) in the presence or absence of ribozyme treatment.

Clinical Summary

Breast cancer is a common cancer in women and also occurs in men to a lesser degree. The incidence of breast cancer in the United States is ~180,000 cases per year and ~46,000 die each year of the disease. In addition, 21,000 new cases of ovarian cancer per year lead to ~13,000 deaths (data from Hung *et al.*, 1995 and the Surveillance, Epidemiology and End Results Program, NCI). Ovarian cancer is a potential secondary indication for anti-HER2 ribozyme therapy.

A full review of breast cancer is given in the NCI PDQ for Breast Cancer. A brief overview is given here. Breast cancer is evaluated or "staged" on the basis of tumor size, and whether it has spread to lymph nodes and/or other parts of the body. In Stage I breast cancer, the cancer is no larger than 2 centimeters and has not spread outside of the breast. In Stage II, the patient's tumor is 2-5 centimeters but cancer may have spread to the axillary lymph nodes. By Stage III, metastasis to the lymph nodes is typical, and tumors are 5 centimeters. Additional tissue involvement (skin, chest wall, ribs, muscles *etc.*) may also be noted. Once cancer has spread to additional organs of the body, it is classed as Stage IV.

Almost all breast cancers (>90%) are detected at Stage I or II, but 31% of these are already lymph node positive. The 5-year survival rate for node negative patients (with standard surgery/radiation/chemotherapy /hormone regimens) is 97%; however,

involvement of the lymph nodes reduces the 5-year survival to only 77%. Involvement of other organs (Stage III) drastically reduces the overall survival, to 22% at 5 years. Thus, chance of recovery from breast cancer is highly dependent on early detection. Because up to 10% of breast cancers are hereditary, those with a family history are considered to be at high risk for breast cancer and should be monitored very closely.

Breast cancer is highly treatable and often curable when detected in the early stages. (For a complete review of breast cancer treatments, see the NCI PDQ for Breast Cancer.) Common therapies include surgery, radiation therapy, chemotherapy and hormonal therapy. Depending upon many factors, including the tumor size, lymph node involvement and location of the lesion, surgical removal varies from lumpectomy (removal of the tumor and some surrounding tissue) to mastectomy (removal of the breast, lymph nodes and some or all of the underlying chest muscle). Even with successful surgical resection, as many as 21% of the patients may ultimately relapse (10-20 years). Thus, once local disease is controlled by surgery, adjuvant radiation treatments, chemotherapies and/or hormonal therapies are typically used to reduce the rate of recurrence and improve survival. The therapy regimen employed depends not only on the stage of the cancer at its time of removal, but other variables such the type of cancer (ductal or lobular), whether lymph nodes were involved and removed, age and general health of the patient and if other organs are involved.

Common chemotherapies include various combinations cytotoxic drugs to kill the cancer cells. These drugs include paclitaxel (Taxol), docetaxel, cisplatin, methotrexate, cyclophosphamide, doxorubin, fluorouracil *etc.* Significant toxicities are associated with these cytotoxic therapies. Well-characterized toxicities include nausea and vomiting, myelosuppression, alopecia and mucosity. Serious cardiac problems are also associated with certain of the combinations, *e.g.* doxorubin and paclitaxel, but are less common.

Testing for estrogen and progesterone receptors helps to determine whether certain anti-hormone therapies might be helpful in inhibiting tumor growth. If either or both receptors are present, therapies to interfere with the action of the hormone ligands, can be given in combination with chemotherapy and are generally continued for several years. These adjuvant therapies are called SERMs, selective estrogen receptor modulators, and they can give beneficial estrogen-like effects on bone and lipid metabolism while antagonizing estrogen in reproductive tissues. Tamoxifen is one such compound. The

primary toxic effect associated with the use of tamoxifen is a 2 to 7-fold increase in the rate of endometrial cancer. Blood clots in the legs and lung and the possibility of stroke are additional side effects. However, tamoxifen has been determined to reduce breast cancer incidence by 49% in high-risk patients and an extensive, somewhat controversial, clinical study is underway to expand the prophylactic use of tamoxifen. Another SERM, raloxifene, was also shown to reduce the incidence of breast cancer in a large clinical trial where it was being used to treat osteoporosis. In additional studies, removal of the ovaries and/or drugs to keep the ovaries from working are being tested.

Bone marrow transplantation is being studied in clinical trials for breast cancers that have become resistant to traditional chemotherapies or where >3 lymph nodes are involved. Marrow is removed from the patient prior to high-dose chemotherapy to protect it from being destroyed, and then replaced after the chemotherapy. Another type of "transplant" involves the exogenous treatment of peripheral blood stem cells with drugs to kill cancer cells prior to replacing the treated cells in the bloodstream.

One biological treatment, a humanized monoclonal anti-HER2 antibody, Herceptin (Genentech) has been approved by the FDA as an additional treatment for HER2 positive tumors. Herceptin binds with high affinity to the extracellular domain of HER2 and thus blocks its signaling action. Herceptin can be used alone or in combination with chemotherapeutics (*i.e.* paclitaxel, docetaxel, cisplatin, *etc.*) (Pegram, *et al.*, 1998). In Phase III studies, Herceptin significantly improved the response rate to chemotherapy as well as improving the time to progression (Ross & Fletcher, 1998). The most common side effects attributed to Herceptin are fever and chills, pain, asthenia, nausea, vomiting, increased cough, diarrhea, headache, dyspnea, infection, rhinitis, and insomnia. Herceptin in combination with chemotherapy (paclitaxel) can lead to cardiotoxicity (Sparano, 1999), leukopenia, anemia, diarrhea, abdominal pain and infection.

HER2 Protein Levels for Patient Screening and as a Potential Endpoint

Because elevated HER2 levels can be detected in at least 30% of breast cancers, breast cancer patients can be pre-screened for elevated HER2 prior to admission to initial clinical trials testing an anti-HER2 ribozyme. Initial HER2 levels can be determined (by ELISA) from tumor biopsies or resected tumor samples.

During clinical trials, it may be possible to monitor circulating HER2 protein by ELISA (Ross and Fletcher, 1998). Evaluation of serial blood/serum samples over the course of the anti-HER2 ribozyme treatment period could be useful in determining early indications of efficacy. In fact, the clinical course of Stage IV breast cancer was correlated with shed HER2 protein fragment following a dose-intensified paclitaxel monotherapy. In all responders, the HER2 serum level decreased below the detection limit (Luftner *et al.*).

Two cancer-associated antigens, CA27.29 and CA15.3, can also be measured in the serum. Both of these glycoproteins have been used as diagnostic markers for breast cancer. CA27.29 levels are higher than CA15.3 in breast cancer patients; the reverse is true in healthy individuals. Of these two markers, CA27.29 was found to better discriminate primary cancer from healthy subjects. In addition, a statistically significant and direct relationship was shown between CA27.29 and large *vs* small tumors and node postive *vs* node negative disease (Gion, *et al.*, 1999). Moreover, both cancer antigens were found to be suitable for the detection of possible metastases during follow-up (Rodriguez de Paterna *et al.*, 1999). Thus, blocking breast tumor growth may be reflected in lower CA27.29 and/or CA15.3 levels compared to a control group. FDA submissions for the use of CA27.29 and CA15.3 for monitoring metastatic breast cancer patients have been filed (reviewed in Beveridge, 1999). Fully automated methods for measurement of either of these markers are commercially available.

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Applicant has designed, synthesized and tested several NCH ribozymes and HH ribozymes targeted against HER2 RNA (see for example **Tables 31 and 34**) in cell proliferation assays.

Proliferation assay:

The model proliferation assay used in the study can require a cell plating density of 2000 cells/well in 96-well plates and at least 2 cell doublings over a 5-day treatment period. To calculate cell density for proliferation assays, the FIPS (fluoro-imaging processing system) method well in the art was used. This method allows for cell density measurements after nucleic acids are stained with CyQuant dye, and has the advantage of

accurately measuring cell densities over a very wide range 1,000-100,000 cells/well in 96-well format.

Ribozymes (50-200 nM) were delivered in the presence of cationic lipid at 2.0 μg/mL and inhibition of proliferation was determined on day 5 post-treatment. Two full ribozyme screens were completed and 4 lead HH and 11 lead NCH ribozymes were chosen for further testing. Of the 15 lead Rzs chosen from primary screens, 4 NCH and 1 HH Rzs continued to inhibit cell proliferation in subsequent experiments. NCH Rzs against sites, 2001 (RPI No. 17236), 2783 (RPI No. 17249), 2939 (RPI No. 17251) or 3998 (RPI No. 17262) caused inhibition of proliferation ranging from 25-60% as compared to a scrambled control Rz (IA; RPI No. 17263). Of the five lead Rzs, the most efficacious is the NCH Rz (RPI No. 17251) against site 2939 of HER2 RNA. An example of results from cell culture assay is shown in **Figure 8**. Referring to **Figure 8**, NCH ribozymes and a HH ribozyme targeted against HER2 RNA, are shown to cause significant inhibition of proliferation of cells. This shows that ribozymes, for instance the NCH ribozymes are capable of inhibiting HER2 gene expression in mammalian cells.

Example 8: Activity of Class II (Zinzyme) nucleic acid catalysts to inhibit HER2 gene expression

Applicant has designed, synthesized and tested several class II (zinzyme) ribozymes targeted against HER2 RNA (see, for example, **Tables 58, 59, and 62**) in cell proliferation RNA reduction assays.

Proliferation assay:

The model proliferation assay used in the study requires a cell-plating density of 2000-10000 cells/well in 96-well plates and at least 2 cell doublings over a 5-day treatment period. Cells used in proliferation studies were either human breast or ovarian cancer cells (SKBR-3 and SKOV-3 cells respectively). To calculate cell density for proliferation assays, the FIPS (fluoro-imaging processing system) method well known in the art was used. This method allows for cell density measurements after nucleic acids are stained with CyQuant® dye, and has the advantage of accurately measuring cell densities over a very wide range 1,000-100,000 cells/well in 96-well format.

Ribozymes (50-200 nM) were delivered in the presence of cationic lipid at 2.0-5.0 μg/mL and inhibition of proliferation was determined on day 5 post-treatment. Two full ribozyme screens were completed resulting in the selection of 14 ribozymes. Class II (zinzyme) ribozymes against sites, 314 (RPI No. 18653), 443 (RPI No. 18680), 597 (RPI No. 18697), 659 (RPI No. 18682), 878 (RPI Nos. 18683 and 18654), 881 (RPI Nos. 18684 and 18685) 934 (RPI No. 18651), 972 (RPI No. 18656, 19292, 19727, 19728, and 19293), 1292 (RPI No. 18726), 1541 (RPI No. 18687), 2116 (RPI No. 18729), 2932 (RPI No. 18678), 2540 (RPI No. 18715), and 3504 (RPI No. 18710) caused inhibition of proliferation ranging from 25-80% as compared to a scrambled control ribozyme. An example of results from a cell culture assay is shown in **Figure 20**. Referring to **Figure 20**, Class II ribozymes targeted against HER2 RNA are shown to cause significant inhibition of proliferation of cells. This shows that ribozymes, for instance the Class II (zinzyme) ribozymes are capable of inhibiting HER2 gene expression in mammalian cells.

<u>RNA assay:</u>

RNA was harvested 24 hours post-treatment using the Qiagen RNeasy® 96 procedure. Real time RT-PCR (TaqMan® assay) was performed on purified RNA samples using separate primer/probe sets specific for either target HER2 RNA or control actin RNA (to normalize for differences due to cell plating or sample recovery). Results are shown as the average of triplicate determinations of HER2 to actin RNA levels post-treatment. **Figure 30** shows class II ribozyme (zinzyme) mediated reduction in HER2 RNA targeting site 972 vs a scrambled attenuated control.

<u>Dose response assays:</u>

Active ribozyme was mixed with binding arm-attenuated control (BAC) ribozyme to a final oligonucleotide concentration of either 100, 200 or 400 nM and delivered to cells in the presence of cationic lipid at 5.0 μg/mL. Mixing active and BAC in this manner maintains the lipid to ribozyme charge ratio throughout the dose response curve. HER2 RNA reduction was measured 24 hours post-treatment and inhibition of proliferation was determined on day 5 post-treatment. The dose response antiproliferation results are summarized in **Figure 31** and the dose-dependent reduction of HER2 RNA results are

summarized in **Figure 32**. **Figure 33** shows a combined dose response plot of both anti-proliferation and RNA reduction data for a class II ribozyme targeting site 972 of HER2 RNA (RPI 19293).

Example 9: Compositions having RNA cleaving activity

Hammerhead ribozymes are an example of catalytic RNA molecules which are able to recognize and cleave a given specific RNA substrate (Hutchins *et al.*,1986, *Nucleic Acids Res.* 14:3627; Keese and Symons, in *Viroids and viroid-like pathogens* (J.J. Semanchik, publ., CRC-Press, Boca Raton, Florida, 1987, pages 1-47). The catalytic center of hammerhead ribozymes is flanked by three stems and can be formed by adjacent sequence regions of the RNA or also by regions, which are separated from one another by many nucleotides. **Figure 6** shows a diagram of such a catalytically active hammerhead structure. The stems have been denoted I, II and III. The nucleotides are numbered according to the standard nomenclature for hammerhead ribozymes (Hertel *et al.*, 1992, *Nucleic Acids Res.* 20:3252). In this nomenclature, bases are denoted by a number, which relates their position relative to the 5' side of the cleavage site. Furthermore, each base that is involved in a stem or loop region has an additional designation (which is denoted by a decimal point and then another number) that defines the position of that base within the stem or loop. A designation of $A^{15.1}$ would indicate that this base is involved in a paired region and that it is the first nucleotide in that stem going away from the core region. This accepted convention for describing hammerhead-derived ribozymes allows for the nucleotides involved in the core of the enzyme to always have the same number relative to all of the other nucleotides. The size of the stems involved in substrate binding or core formation can be any size and of any sequence, and the position of A^9, for example, will remain the same relative to all of the other core nucleotides. Nucleotides designated, for example, $N^{\wedge 12}$ or $N^{9\wedge}$ represent an inserted nucleotide where the position of the caret (^) relative to the number denotes whether the insertion is before or after the indicated nucleotide. Thus, $N^{\wedge 12}$ represents a nucleotide inserted before nucleotide position 12, and $N^{9\wedge}$ represents a nucleotide inserted after nucleotide position 9.

The consensus sequence of the catalytic core structure is described by Ruffner and Uhlenbeck, 1990, *Nucleic Acids Res.* 18:6025-6029. Perriman *et al.*, 1992, *Gene* 113:157-163, have meanwhile shown that this structure can also contain variations, for example,

naturally occurring nucleotide insertions such as N^{9}^ and N^^{12}. Thus, the positive strand of the satellite RNA of the tobacco ring-spot virus does not contain any of the two nucleotide insertions while the +RNA strand of the virusoid of the lucerne transient streak virus (vLTSV) contains a N^{9}^ = U insertion which can be mutated to C or G without loss of activity (Sheldon and Symons, 1989, *Nucleic Acids Res.* 17:5679-5685). Furthermore, in this special case, N^7 = A and $R^{15.1}$ = A. On the other hand, the minus strand of the carnation stunt associated viroid (-CarSV) is quite unusual since it contains both nucleotide insertions, that is N^^{12} = A and N^{9}^ = C (Hernandez *et al.*,1992, *Nucleic Acids Res.* 20:6323-6329). In this viroid N^7 = A and $R^{15.1}$ = A. In addition, this special hammerhead structure exhibits a very effective self-catalytic cleavage despite the more open central stem.

Possible uses of hammerhead ribozymes include, for example, generation of RNA restriction enzymes and the specific inactivation of the expression of genes in, for example, animal, human or plant cells and prokaryotes, yeasts and plasmodia. A particular biomedical interest is based on the fact that many diseases, including many forms of tumors, are related to the overexpression of specific genes. Inactivating such genes by cleaving the associated mRNA represents a possible way to control and eventually treat such diseases. Moreover there is a great need to develop antiviral, antibacterial, and antifungal pharmaceutical agents. Ribozymes have potential as such anti-infective agents since RNA molecules vital to the survival of the organism can be selectively destroyed.

In addition to needing the correct hybridizing sequences for substrate binding, substrates for hammerhead ribozymes have been shown to strongly prefer the triplet $N^{16.2}U^{16.1}H^{17}$ (NUH) where N can be any nucleotide, U is uridine, and H is either adenosine, cytidine, or uridine (Koizumi *et al.*, 1988, *FEBS Lett.* 228, 228-230; Ruffner *et al.*, 1990, *Biochemistry* 29, 10695-10702 ; Perriman *et al.*, 1992, *Gene* 113, 157-163). NUH is sometimes designated as NUX. The fact that changes to this general rule for substrate specificity result in non-functional substrates implies that there are "non core compatible" structures which are formed when substrates are provided which deviate from the stated requirements. Evidence along these lines was recently reported by Uhlenbeck and co-workers (Uhlenbeck *et al.,* 1997, *Biochemistry* 36:1108-1114) when they demonstrated that the substitution of a G at position 17 caused a functionally catastrophic base pair between G^{17} and C^3 to form, both preventing the correct orientation of the

scissile bond for cleavage and the needed tertiary interactions of C^3 (Murray *et al.*, 1995, *Biochem. J.* 311:487-494). The strong preference for a U at position 16.1 may exist for similar reasons. Many experiments have been done in an attempt to isolate ribozymes which are able to efficiently relieve the requirement of a U at position 16.1, however, attempts to find hammerhead type ribozymes which can cleave substrates having a base other than a U at position 16.1 have proven impossible (Perriman *et al.*, 1992, *Gene* 113, 157-163).

Efficient catalytic molecules with reduced or altered requirements in the cleavage region are highly desirable because their isolation would greatly increase the number of available target sequences that molecules of this type could cleave. For example, it would be desirable to have a ribozyme variant that could efficiently cleave substrates containing triplets other than $N^{16.2}U^{16.1}H^{17}$ since this would increase the number of potential target cleavage sites.

Chemically modified oligonucleotides which contain a block of deoxyribonucleotides in the middle region of the molecule have potential as pharmaceutical agents for the specific inactivation of the expression of genes (Giles *et al.*, 1992, *Nucleic Acids Res.* 20:763-770). These oligonucleotides can form a hybrid DNA-RNA duplex in which the DNA bound RNA strand is degraded by RNase H. Such oligonucleotides are considered to promote cleavage of the RNA and so cannot be characterized as having an RNA-cleaving activity nor as cleaving an RNA molecule (the RNase H is cleaving). A significant disadvantage of these oligonucleotides for *in vivo* applications is their low specificity, since hybrid formation, and thus cleavage, can also take place at undesired positions on the RNA molecules.

Since, unmodified ribozymes are sensitive to degradation by RNases, chemically modified active substances have to be used in order to administer hammerhead ribozymes exogenously (discussed, for example, by Heidenreich *et al.*, 1994, *J. Biol. Chem.* 269:2131-2138; Kiehntopf *et al.*, 1994, *EMBO J.* 13:4645-4652; Paolella *et al.*, 1992, *EMBO J.* 11:1913-1919; and Usman *et al.*, 1994, *Nucleic Acids Symp. Ser.* 31:163-164).

Sproat *et al.*, U.S. Pat. No. 5,334,711, describe such chemically modified active substances based on synthetic catalytic oligonucleotide structures with a length of 35 to 40 nucleotides which are suitable for cleaving a nucleic acid target sequence and contain modified nucleotides that contain an optionally substituted alkyl, alkenyl or alkynyl group

with 1 - 10 carbon atoms at the 2'-O atom of the ribose. These oligonucleotides contain modified nucleotide building blocks and form a structure resembling a hammerhead structure. These oligonucleotides are able to cleave specific RNA substrates.

Usman *et al.*, U.S. Patent No. 5,891,684, describe enzymatic nucleic acid molecules with one or more nucleotide base modification(s) in a substrate binding arm.

Thompson *et al.*, US Patent No. 5,599,704 describe enzymatic RNA molecules targeted against ErbB2/*neu*/Her2 RNA.

Sullivan *et al.*, US Patent No. 5,616,490 describe enzymatic RNA molecules targeted against protein kinase C (PKC) RNA.

Sioud, International PCT publication No. WO 99/63066 describe hammerhead ribozymes targeted against specific sites within protein kinase C alpha (PKC alpha), VEGF, and TNF alpha RNA.

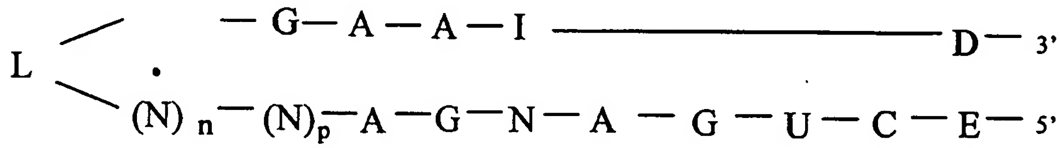
Jarvis *et al.*, International PCT publication No. WO 98/505030, describe the synthesis of xylo-ribonucleosides and oligonucleotides comprising xylo modifications.

This invention relates to novel enzymatic nucleic acid molecules having an RNA-cleavage activity, as well as their use for cleaving RNA substrates *in vitro* and *in vivo*. The compositions contain an active center, the subunits of which are selected from nucleotides and/or nucleotide analogues, as well as flanking regions contributing to the formation of a specific hybridization with an RNA substrate. Preferred compositions form, in combination with an RNA substrate, a structure resembling a hammerhead structure. The active center of the disclosed compositions is characterized by the presence of $I^{15.1}$ which allows cleavage of RNA substrates having $C^{16.1}$. It is therefore an object of the present invention to provide compositions that cleave RNA, and in particular to provide RNA-cleaving oligomers which at the same time have a high stability, activity, and specificity. This invention relates to novel nucleic acid molecules with catalytic activity, which are particularly useful for cleavage of RNA or DNA or combination thereof. The nucleic acid catalysts of the instant invention are distinct from other nucleic acid catalysts known in the art. Specifically, nucleic acid catalysts of the instant invention are capable of catalyzing an intermolecular or intramolecular endonuclease reaction.

It is another object of the present invention to provide compositions that cleave RNA substrates having a cleavage site triplet other than $N^{16.2}U^{16.1}H^{17}$ (NUH; **Figure 6**), where N is a nucleotide, U is uridine and H is adenosine, uridine or cytidine. H is used

interchangably with X. Specifically, the enzymatic nucleic acid molecule of the instant invention has an endonuclease activity to cleave RNA substrates having a cleavage triplet $N^{16.2}C^{16.1}H^{17}$ (NCH; **Figure 6**), where N is a nucleotide, C is cytidine and H is adenosine, uridine or cytidine. H is used interchangeably with X. In another aspect the invention features an enzymatic nucleic acid molecule of the instant invention has an endonuclease activity to cleave RNA substrates having a cleavage triplet $N^{16.2}C^{16.1}N^{17}$ (NCN; **Figure 6**), where N is a nucleotide, C is cytidine.

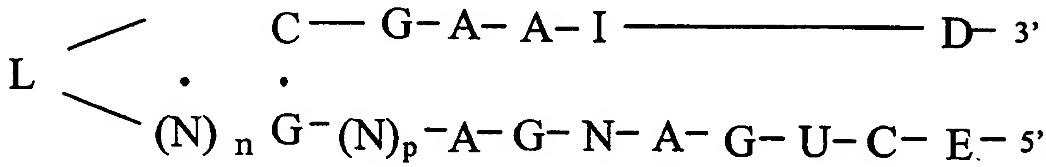
In a preferred embodiment, the invention features an enzymatic nucleic acid molecule having formula 1:



where N represents independently a nucleotide or a non-nucleotide linker, which may be same or different; D and E are independently oligonucleotides of length sufficient to stably interact (*e.g.*, by forming hydrogen bonds with complementary nucleotides in the target) with a target nucleic acid molecule (the target can be an RNA, DNA or mixed polymers), preferably, the length of D and E are independently between 3-20 nucleotides long, specifically, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, and 20; o and n are integers independently greater than or equal to 1 and preferably less than about 100, specifically 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 50, wherein if $(N)_o$ and $(N)_n$ are nucleotides, (N)o and (N)n are optionally able to interact by hydrogen bond interaction, in particular if n =1 and o=1 then (N)n is preferably a purine (*e.g.*, G, and A) and (N)o is preferably a pyrimidine (*e.g.*, C and U) and (N)n preferably forms; • indicates base-paired interaction; L is a linker which may be present or absent (*i.e.*, the molecule may be assembled from two separate oligonucleotides), but when present, is a nucleotide and/or a non-nucleotide linker, which may be a single-stranded and/or double-stranded region; p is an integer 0 or 1, when p=1, (N)p is preferably A or U; and ______ represents a chemical linkage (*e.g.* a phosphate ester linkage, amide linkage, phosphorothioate linkage or others known in the art). A, U, I, C and G represent adenosine, uridine, inosine, cytidine and guanosine nucleotides, respectively. The N in 5'-CUGANGA-3' region of formula 1 is preferably U.

The nucleotides in the formula 1 are unmodified or modified at the sugar, base, and/or phosphate as known in the art.

In a preferred embodiment, the invention features an enzymatic nucleic acid molecule having formula 2:



where N represents independently a nucleotide or a non-nucleotide linker, which may be same or different; D and E are independently oligonucleotides of length sufficient to stably interact (*e.g.*, by forming hydrogen bonds with complementary nucleotides in the target) with a target nucleic acid molecule (the target can be an RNA, DNA or mixed polymers), preferably, the length of D and E are independently between 3-20 nucleotides long, specifically, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, and 20; o and n are integers independently greater than or equal to 0 and preferably less than about 100, specifically 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 50, wherein if $(N)_o$ and $(N)_n$ are nucleotides, (N)o and (N)n are optionally able to interact by hydrogen bond interaction; • indicates base-paired interaction; L is a linker which may be present or absent (*i.e.*, the molecule may be assembled from two separate oligonucleotides), but when present, is a nucleotide and/or a non-nucleotide linker, which may be a single-stranded and/or double-stranded region; p is an integer 0 or 1, when p=1, (N)p is preferably A, C or U; and __________ represents a chemical linkage (*e.g.* a phosphate ester linkage, amide linkage, phosphorothioate linkage or others known in the art). A, U, I, C and G represent adenosine, uridine, inosine, cytidine and guanosine nucleotides, respectively. The N in 5'-CUGANGA-3' region of formula 2 is preferably U. The nucleotides in the formula 2 are unmodified or modified at the sugar, base, and/or phosphate as known in the art.

In a preferred embodiment, the I (inosine) in formula 1 and 2 is preferably a ribo-inosine or a xylo-inosine.

In yet another embodiment, the nucleotide linker (L) is a nucleic acid aptamer, such as an ATP aptamer, HIV Rev aptamer (RRE), HIV Tat aptamer (TAR) and others (for a review see Gold *et al.*, 1995, *Annu. Rev. Biochem.*, 64, 763; and Szostak & Ellington, 1993, in *The RNA World*, ed. Gesteland and Atkins, pp 511, CSH Laboratory Press). A "nucleic acid aptamer" as used herein is meant to indicate nucleic acid sequence capable of interacting with a ligand. The ligand can be any natural or a synthetic molecule, including but not limited to a resin, metabolites, nucleosides, nucleotides, drugs, toxins, transition state analogs, peptides, lipids, proteins, amino acids, nucleic acid molecules, hormones, carbohydrates, receptors, cells, viruses, bacteria and others. In a preferred embodiment L has the sequence 5'-GAAA-3' or 5'-GUUA-3'.

In yet another embodiment, the non-nucleotide linker (L) is as defined herein.

The term "non-nucleotide", as used herein, includes either abasic nucleotide, polyether, polyamine, polyamide, peptide, carbohydrate, lipid, or polyhydrocarbon compounds. Specific examples include those described by Seela and Kaiser, *Nucleic Acids Res.* 1990, *18*:6353 and *Nucleic Acids Res.* 1987, *15*:3113; Cload and Schepartz, *J. Am. Chem. Soc.* 1991, *113*:6324; Richardson and Schepartz, *J. Am. Chem. Soc.* 1991, *113*:5109; Ma et al., *Nucleic Acids Res.* 1993, *21*:2585 and *Biochemistry* 1993, *32*:1751; Durand et al., *Nucleic Acids Res.* 1990, *18*:6353; McCurdy et al., *Nucleosides & Nucleotides* 1991, *10*:287; Jschke et al., *Tetrahedron Lett.* 1993, *34*:301; Ono et al., *Biochemistry* 1991, *30*:9914; Arnold *et al.*, International Publication No. WO 89/02439; Usman *et al.*, International Publication No. WO 95/06731; Dudycz *et al.*, International Publication No. WO 95/11910 and Ferentz and Verdine, *J. Am. Chem. Soc.* 1991, *113*:4000, all hereby incorporated by reference herein. Non-nucleotide linkers can be any molecule, which is not an oligomeric sequence, that can be covalently coupled to an oligomeric sequence. Preferred non-nucleotide linkers are oligomeric molecules formed of non-nucleotide subunits. Examples of such non-nucleotide linkers are described by Letsinger and Wu, (*J. Am. Chem. Soc.* 117:7323-7328 (1995)), Benseler *et al.*, (*J. Am. Chem. Soc.* 115:8483-8484 (1993)) and Fu *et al.*, (*J. Am. Chem. Soc.* 116:4591-4598 (1994)). Preferred non-nucleotide linkers, or subunits for non-nucleotide linkers, include substituted or unsubstituted C_1-C_{10} straight chain or branched alkyl, substituted or unsubstituted C_2-C_{10} straight chain or branched alkenyl, substituted or unsubstituted C_2-C_{10} straight chain or branched alkynyl, substituted or unsubstituted C_1-C_{10} straight chain or

branched alkoxy, substituted or unsubstituted C_2-C_{10} straight chain or branched alkenyloxy, and substituted or unsubstituted C_2-C_{10} straight chain or branched alkynyloxy. The substituents for these preferred non-nucleotide linkers (or subunits) can be halogen, cyano, amino, carboxy, ester, ether, carboxamide, hydroxy, or mercapto. Thus, in a preferred embodiment, the invention features an enzymatic nucleic acid molecule having one or more non-nucleotide moieties, and having enzymatic activity to cleave an RNA or DNA molecule. By the term "non-nucleotide" is meant any group or compound which can be incorporated into a nucleic acid chain in the place of one or more nucleotide units, including either sugar and/or phosphate substitutions, and allows the remaining bases to exhibit their enzymatic activity. The group or compound is abasic in that it does not contain a commonly recognized nucleotide base, such as adenosine, guanine, cytosine, uracil or thymine. The terms "abasic" or "abasic nucleotide" as used herein encompass sugar moieties lacking a base or having other chemical groups in place of nucleotide base at the 1' position.

In a preferred embodiment, the invention features modified ribozymes with phosphate backbone modifications comprising one or more phosphorothioate, phosphorodithioate, methylphosphonate, morpholino, amidate carbamate, carboxymethyl, acetamidate, polyamide, sulfonate, sulfonamide, sulfamate, formacetal, thioformacetal, and/or alkylsilyl, substitutions. For a review of oligonucleotide backbone modifications see Hunziker and Leumann, 1995, *Nucleic Acid Analogues: Synthesis and Properties*, in *Modern Synthetic Methods*, VCH, 331-417, and Mesmaeker *et al.*, 1994, *Novel Backbone Replacements for Oligonucleotides*, in *Carbohydrate Modifications in Antisense Research*, ACS, 24-39.

In a further preferred embodiment of the instant invention, an inverted deoxy abasic moiety is utilized at the 3' end of the enzymatic nucleic acid molecule.

By "pyrimidines" is meant nucleotides comprising modified or unmodified derivatives of a six membered pyrimidine ring. An example of a pyrimidine is modified or unmodified uridine.

In a preferred embodiment, the nucleosides of the instant invention include, 2'-*O*-methyl-2,6-diaminopurine riboside; 2'-deoxy-2'amino-2,6-diaminopurine riboside; 2'-(*N*-alanyl) amino-2'-deoxy-uridine; 2'-(*N*-phenylalanyl)amino-2'-deoxy-uridine; 2'-deoxy -2'-(*N*-beta-alanyl) amino ; 2'-deoxy-2'-(lysiyl) amino uridine; 2'-*C*-allyl uridine; 2'-*O*-amino-

uridine; 2'-*O*-methylthiomethyl adenosine; 2'-*O*-methylthiomethyl cytidine ; 2'-*O*-methylthiomethyl guanosine; 2'-*O*-methylthiomethyl-uridine; 2'-Deoxy-2'-(*N*-histidyl) amino uridine; 2'-deoxy-2'-amino-5-methyl cytidine; 2'-(*N*-β-carboxamidine-beta-alanyl)amino-2'-deoxy-uridine; 2'-deoxy-2'-(N-beta-alanyl)-guanosine; 2'-*O*-amino-adenosine; 2'-(*N*-lysyl)amino -2'-deoxy-cytidine; 2'-Deoxy -2'-(L-histidine) amino Cytidine; and 5-Imidazoleacetic acid 2'-deoxy-5'-triphosphate uridine.

By "oligonucleotide" as used herein is meant a molecule having two or more nucleotides. The polynucleotide can be single, double or multiple stranded and may have modified or unmodified nucleotides or non-nucleotides or various mixtures and combinations thereof.

In a preferred embodiment, the enzymatic nucleic acid molecule of formula 1 or 2 include at least three ribonucleotide residues, preferably 4, 5, 6, 7, 8, 9, and 10 ribonucleotide residues.

In preferred embodiments, the enzymatic nucleic acid of the instant invention includes one or more stretches of RNA, which provide the enzymatic activity of the molecule, linked to the non-nucleotide moiety. The necessary RNA components are known in the art (see for *e.g.*, Usman *et al., supra).*

Thus, in one preferred embodiment, the invention features enzymatic nucleic acid molecules that inhibit gene expression and/or cell proliferation *in vitro* or *in vivo* (*e.g.* in patients). These chemically or enzymatically synthesized nucleic acid molecules contain substrate binding domains that bind to accessible regions of specific target nucleic acid molecules. The nucleic acid molecules also contain domains that catalyze the cleavage of target. Upon binding, the enzymatic nucleic acid molecules cleave the target molecules, preventing for example, translation and protein accumulation. In the absence of the expression of the target gene, cell proliferation, for example, is inhibited.

In another preferred embodiment, catalytic activity of the molecules described in the instant invention can be optimized as described by Draper et al., *supra*. The details will not be repeated here, but include altering the length of the ribozyme binding arms, or chemically synthesizing ribozymes with modifications (base, sugar and/or phosphate) that prevent their degradation by serum ribonucleases and/or enhance their enzymatic activity (see *e.g.*, Eckstein *et al.*, International Publication No. WO 92/07065; Perrault *et al.*, 1990 *Nature* 344, 565; Pieken et al., 1991 *Science* 253, 314; Usman and Cedergren, 1992

Trends in Biochem. Sci. 17, 334; Usman *et al.*, International Publication No. WO 93/15187; and Rossi *et al.*, International Publication No. WO 91/03162; Sproat, US Patent No. 5,334,711; and Burgin *et al., supra;* all of these describe various chemical modifications that can be made to the base, phosphate and/or sugar moieties of enzymatic RNA molecules). Modifications which enhance their efficacy in cells, and removal of bases from stem loop structures to shorten RNA synthesis times and reduce chemical requirements are desired. (All these publications are hereby incorporated by reference herein.).

By "nucleic acid catalyst" as used herein is meant a nucleic acid molecule (*e.g.*, the molecule of formulae 1 and 2) capable of catalyzing (altering the velocity and/or rate of) a variety of reactions including the ability to repeatedly cleave other separate nucleic acid molecules (endonuclease activity) in a nucleotide base sequence-specific manner. Such a molecule with endonuclease activity may have complementarity in a substrate binding region to a specified gene target, and also has an enzymatic activity that specifically cleaves RNA or DNA in that target. That is, the nucleic acid molecule with endonuclease activity is able to intramolecularly or intermolecularly cleave RNA or DNA and thereby inactivate a target RNA or DNA molecule. This complementarity functions to allow sufficient hybridization of the enzymatic RNA molecule to the target RNA or DNA to allow the cleavage to occur. 100% complementarity is preferred, but complementarity as low as 50-75% may also be useful in this invention. The nucleic acids may be modified at the base, sugar, and/or phosphate groups. The term enzymatic nucleic acid as used herein is used interchangeably with phrases such as ribozymes, catalytic RNA, enzymatic RNA, catalytic oligonucleotides, nucleozyme, RNA enzyme, endoribonuclease, endonuclease, minizyme, oligozyme, finderon or nucleic acid catalyst. All of these terminologies describe nucleic acid molecules of the instant invention with enzymatic activity. The specific examples of enzymatic nucleic acid molecules described in the instant application are not limiting in the invention and those skilled in the art will recognize that all that is important in an enzymatic nucleic acid molecule of this invention is that it has a specific substrate binding site which is complementary to one or more of the target nucleic acid regions, and that it have nucleotide sequences within or surrounding that substrate binding site which impart a nucleic acid cleaving activity to the molecule (Cech et al., U.S. Patent No. 4,987,071; Cech *et al.*, 1988, 260 *JAMA* 3030).

The enzymatic nucleic acid molecule of Formula 1 or 2 may independently comprise a cap structure which may independently be present or absent.

By "chimeric nucleic acid molecule" or "mixed polymer" is meant that, the molecule may be comprised of both modified or unmodified nucleotides.

In yet another preferred embodiment, the 3'-cap is selected from a group comprising, 4',5'-methylene nucleotide; 1-(beta-D-erythrofuranosyl) nucleotide; 4'-thio nucleotide, carbocyclic nucleotide; 5'-amino-alkyl phosphate; 1,3-diamino-2-propyl phosphate, 3-aminopropyl phosphate; 6-aminohexyl phosphate; 1,2-aminododecyl phosphate; hydroxypropyl phosphate; 1,5-anhydrohexitol nucleotide; L-nucleotide; alpha-nucleotide; modified base nucleotide; phosphorodithioate; *threo*-pentofuranosyl nucleotide; acyclic 3',4'-seco nucleotide; 3,4-dihydroxybutyl nucleotide; 3,5-dihydroxypentyl nucleotide, 5'-5'-inverted nucleotide moiety; 5'-5'-inverted abasic moiety; 5'-phosphoramidate; 5'-phosphorothioate; 1,4-butanediol phosphate; 5'-amino; bridging and/or non-bridging 5'-phosphoramidate, phosphorothioate and/or phosphorodithioate, bridging or non bridging methylphosphonate and 5'-mercapto moieties (for more details, see Beaucage and Iyer, 1993, *Tetrahedron* 49, 1925; incorporated by reference herein). By the term "non-nucleotide" is meant any group or compound which can be incorporated into a nucleic acid chain in the place of one or more nucleotide units, including either sugar and/or phosphate substitutions, and allows the remaining bases to exhibit their enzymatic activity. The group or compound is abasic in that it does not contain a commonly recognized nucleotide base, such as adenosine, guanine, cytosine, uracil or thymine. The terms "abasic" or "abasic nucleotide" as used herein encompass sugar moieties lacking a base or having other chemical groups in place of a base at the 1' position.

In a preferred embodiment, the invention features 1-(beta-D-xylofuranosyl)-xypoxanthine phosphoramidite and a process for the synthesis thereof and incorporation into oligonucleotides, such as enzymatic nucleic acid molecule.

In yet another preferred embodiment, the invention features enzymatic nucleic acid molecules targeted against HER2 RNA, specifically, ribozymes in the hammerhead and NCH motifs.

In a preferred embodiment, the invention features enzymatic nucleic acid molecules targeted against PKC alpha RNA, specifically, ribozymes in the hammerhead and NCH motifs.

Targets, for example PKC alpha RNA, for useful ribozymes and antisense nucleic acids can be determined, for example, as described in Draper *et al.*, WO 95/04818; McSwiggen *et al.*, U.S. Patent Nos. 5,525,468 and 5,646,042, all are hereby incorporated by reference herein in their totality. Other examples include the following PCT applications, which concern inactivation of expression of disease-related genes: WO 95/23225, WO 95/13380, WO 94/02595, all incorporated by reference herein.

The specific enzymatic nucleic acid molecules described in the instant application are not limiting in the invention and those skilled in the art will recognize that all that is important in an enzymatic nucleic acid molecule of this invention is that it has a specific substrate binding site (*e.g.*, D and E of Formula 1 above) which is complementary to one or more of the target nucleic acid regions, and that it have nucleotide sequences within or surrounding that substrate binding site which impart a nucleic acid cleaving activity to the molecule.

All naturally occurring hammerhead ribozymes have an $A^{15.1}$-$U^{16.1}$ base pair. In addition, it is known that substrates for ribozymes based on the consensus hammerhead sequence strongly prefer a substrate that contains an $N^{16.2}U^{16.1}H^{17}$ triplet in which H^{17} is not a guanosine (Koizumi *et al.*, *FEBS Lett.* 228, 228-230 (1988); Ruffner *et al.*, *Biochemistry* 29, 10695-10702 (1990); Perriman *et al.*, *Gene* 113, 157-163 (1992)). Many experiments have been done in an attempt to isolate ribozymes which are able to efficiently relieve the requirement of a U at position 16.1, however, attempts to find ribozymes which can cleave substrates having a base other than a U at position 16.1 have proven largely unsuccessful (Perriman *et al.*, *Gene* 113, 157-163 1992, Singh *et al.*, *Antisense and Nucleic Acid Drug Development* 6:165-168 (1996)).

However, examination of the recently published X-ray crystal structures (Pley *et al.*, *Nature* 372:68-74 (1994), Scott *et al.*, *Cell* 81:991-1002 (1995), and Scott *et al.*, *Science* 274:2065-2069 (1996)) led to the realization that the $A^{15.1}$-$U^{16.1}$ interaction is a non-standard base pair with a single hydrogen bond between the exocyclic amine (N6) of the adenosine and the 4-oxo group of the uridine. Modeling studies (based on the crystal structure) then led to the discovery that the interaction of the wild-type $A^{15.1}$-$U^{16.1}$ base pair can be spatially mimicked by replacement with an $I^{15.1}$-$C^{16.1}$ base pair that adopts an isostructural orientation and which preserves the required contact of the 2-keto group of $C^{16.1}$ with A^6 of the uridine turn. In the model, the polarity of the stabilizing hydrogen

bond between positions 15.1 and 16.1 is reversed in the $I^{15.1}$-$C^{16.1}$ interaction, but the correct orientation of the bases around this bond is maintained.

It has been discovered that hammerhead ribozyme analogues containing an inosine at position 15.1 readily cleave RNA substrates containing an $N^{16.2}C^{16.1}H^{17}$ triplet. Based on this, disclosed are compositions, preferably synthetic oligomers, which cleave a nucleic acid target sequence containing the triplet $N^{16.2}C^{16.1}H^{17}$. It is preferred that H^{17} is not guanosine, however, under certain circumstances, NCG triplet containing RNA can be cleaved by the ribozymes of the instant invention. The ability to cleave substrates having $N^{16.2}C^{16.1}X^{17}$ triplets effectively doubles the number of targets available for cleavage by compositions of the type disclosed.

Example 10: Synthesis of 1-(beta-D-xylofuranosyl)-xypoxanthine phosphoramidite

Referring to **Figure 9**, Inosine (**1**) was 5'-*O*-monomethoxytritylated and 2'-*O*-silylated under standard conditions to afford **2** (Charubala, R; Pfleiderer, W. *Heterocycles* **1990**, *30*, 1141). Oxidation/reduction procedure afforded **3** in moderate yield (Matulic-Adamic, J.; Daniher, A.T.; Gonzalez, C.; Beigelman, L. *Bioorg. Med. Chem. Lett.*. **1999**, *9*, 157): ^{1}H NMR ($CDCl_3$) δ 12.80 (br s, 1H, NH), 8.11 (s, 1H, H-8), 8.08 (s, 1H, H-2), 7.45-6.80 (m, 14H, trityl), 5.85 (d, $J_{1',2'}$= 1.6, 1H, H-1'), 4.83 (d, $J_{2',3'}$=7.2, 1H, H-2'), 4.46 (br s, 1H, 3'-OH), 4.34 (m, 1H, H-4'), 4.06 (m, 1H, H-3'), 3.77 (s, 6H, 2 x OMe), 3.60 (app d, 2H, H-5', H-5"), 0.89 (s, 9H, *t*-Bu), 0.07 (s, 3H, Me), 0.06 (s, 3H, Me).

Standard phosphitylation of 3 afforded the desired phosphoramidite 4.

More acid stable 5'-*O*-MMT group is used in this particular case because applicant found that 5'-*O*-DMT protection is more labile in xylo nucleoside series than in ribo nucleoside series.

The xylo-inosine was incorporated into oligonucleotides using the standard procedures known in the art and as described herein.

Example 11: Activity of the xylo-Inosine-modified NCH Ribozyme

Several NCH ribozymes with xylo-inosine at position 15.1 were designed (**Figure 7**) to cleave RNA containing GCA, ACA, UCA or the CCA triplet. These ribozymes were

synthesized and purified as described herein and tested using standard RNA cleavage reaction conditions (see **Table 31**, for example, and see below).

The ribozymes were chemically synthesized. The method of synthesis used followed the procedure for normal RNA synthesis as described above and in Usman et al., (1987 J. Am. Chem. Soc., 109, 7845), Scaringe et al., (1990 Nucleic Acids Res., 18, 5433) and Wincott et al., supra, and made use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The average stepwise coupling yields were >98%.

Ribozymes were purified by gel electrophoresis using general methods or were purified by high pressure liquid chromatography (HPLC; See Wincott et al., supra; the totality of which is hereby incorporated herein by reference) and were resuspended in water. The sequences of the chemically synthesized ribozymes used in this study are shown below in **Table 33.**

Cleavage Reactions: Full-length or partially full-length, internally-labeled target RNA for ribozyme cleavage assay is prepared by *in vitro* transcription in the presence of [alpha-^{32}p] CTP, passed over a G 50 Sephadex column by spin chromatography and used as substrate RNA without further purification. Alternately, substrates were 5'-^{32}P-end labeled using T4 polynucleotide kinase enzyme. Assays are performed by pre-warming a 2X concentration of purified ribozyme in ribozyme cleavage buffer (50 mM Tris-HCl, pH 7.5 at 37°C, 10 mM $MgCl_2$) and the cleavage reaction was initiated by adding the 2X ribozyme mix to an equal volume of substrate RNA (maximum of 1-5 nM) that was also pre-warmed in cleavage buffer. As an initial screen, assays are carried out for 1 hour at 37°C using a final concentration of 40 nM or 1 mM ribozyme, *i.e.,* ribozyme excess. The reaction is quenched by the addition of an equal volume of 95% formamide, 20 mM EDTA, 0.05% bromophenol blue and 0.05% xylene cyanol after which the sample is heated to 95°C for 2 minutes, quick chilled and loaded onto a denaturing polyacrylamide gel. Substrate RNA and the specific RNA cleavage products generated by ribozyme cleavage are visualized on an autoradiograph of the gel. The percentage of cleavage is determined by Phosphor Imager® quantitation of bands representing the intact substrate and the cleavage products.

The results of the experiments are summarized in **Table 32**, which shows that NCH-xylo ribozymes are catalytically active to cleave target RNA.

Example 12: Activity of NCH Ribozyme variants

The nucleic acid molecules of the instant invention allow for the ability to cleave a new set of 12 NCH triplets. Determination of single turnover rate constants at pH 6 of these ribozymes in the all ribo form show that with NCA type triplets, the cleavage rate is higher than at NUA sites. NCC and NUC site rates are similar, and NCU sites are slightly lower than NUU sites. Additional measurements of multiple turnover parameters of the all ribo ribozymes performed under non-saturating conditions using 5nM ribozyme and changing the substrate concentration from 50 to 500 nM at pH 7.4 with 10 mM Mg^{++} at 37 °C gave Km = 100 nM and kcat =6.5 min^{-1} for GCA vs Km =30 nM and kcat =2.0 min^{-1} for GUA cleaving all ribo ribozymes. These data verify that the ribozymes with an I•C base pair are efficient catalysts in multiple turnover reactions and the relative order of activity between NCH and NUH cleavers established at pH 6 (Ludwig *et al.*, 1998, *Nucleic Acids Res.*, 26, 2279-2285) remains unchanged.

To gain more insight into the structural requirements of the 15.1- 16.1 base pair of the ribozymes of the instant invention, applicant synthesized several variants of the active I-15.1 •C-16.1 structure and tested these ribozyme analogues with their corresponding substrates. The influence of several core stabilization strategies on the activity of the NCH cleaving ribozymes was also investigated.

Various nucleoside analogs were incorporated at position 15.1 of the ribozyme. Cleavage activity was tested with the complementary Fl* labeled substrates at pH 7.4 in the presence of 10 mM Mg^{++} under conditions of ribozyme excess (i.e. single turnover conditions). The modified oligonucleotides were synthesized by standard oligonucleotide synthesis procedures. Xanthosine was protected using O-2,O-4 pivaloyloxymethyl groups; N,N-dimethylguanosine with 6-O-(2-nitrophenyl-)ethyl and 6-thio-inosine with S-cyanoethyl protecting groups. The cleavage activity of the ribozymes containing the 15.1 analogs is summarized in **Figure 36**. For comparison **Figure 37** summarizes reported functional group modification studies performed at the A 15.1 residue in the A-15.1 •U-16.1 context of NUH cleaving ribozymes.

Modifications at the purine 15.1 N1 and/or C6 positions **(Figure 36 A, B, C)**

In the 6-thio-inosine **(A)** (sI) 15.1 substituted ribozyme, the original (I-15.1) position 6 O•H-N (C-16.1) bonds are replaced by weaker (sI-15.1) position 6 S•H-N (C-16.1) hydrogen bonds while all other functional groups remain unchanged. Ribozymes with an adenosine **(B)** at position 15.1 (A-15.1) are inactive with C-16.1 substrates since the ribozyme geometry requires the [A-15.1] position 6 amino group and the [C-16.1] position 4 amino group hydrogen-bond donor functional groups to be in close proximity. Similarly, low activity is observed with I-15.1 ribozymes and U-16.1 substrates, where the [I-15.1] position 6 keto and [C-16.1] position 4 keto hydrogen-bond acceptor groups are opposed **(Figure 37, B)**. Although inosine can form stable mismatch pairs with uridine in RNA duplexes or in tRNA anticodon-mRNA interactions, these results suggest that the geometry in the I•U mismatches differ from that of the A•U (or I•C) base pair in the active NUH ribozyme. Substitution of N1-Methyl-inosine **(C)** in place of inosine at position 15.1 leads to complete loss of cleavage activity.

Modifications at the purine 15.1 C2 and/or N3 position **(Figure 36 D, E, F)**

The extremely low activity observed with the G-15.1 **(D)** substituted analog may be explained by the formation of a G-C Watson-Crick base pair. The replacement of the I•C pair with a G•C pair can significantly distort the geometry at the 15.1-16.1 position. G-15.1 N2-alkylation **(E)** gives only minimal recovery of catalytic activity compared to G-15.1, suggesting that the steric problems introduced by the bulky N-methyl groups may interfere with stacking interactions. The activity of this construct is significantly less than that of iso-G-15.1 **(Figure 37, E)** containing ribozymes in the standard A-U context. Xanthosine 15.1 **(F)** contains the same functional groups as inosine at the N1 and C6 sites but contains an additional hydrogen-bond donor site at position N3 along with a C2 carbonyl group. The complete lack of activity seen with this construct reinforces the importance of the purine N3 acceptor functionality in transition state formation. Similarly, 3-deaza-adenosine **(Figure 37, F)** containing ribozymes were also inactive. The C2 carbonyl of the 15.1 purine shows no significant negative interference in iso-guanosine containing 15.1 ribozymes.

Activity of modified core variants

To complete the characterization of the I•C pair containing ribozymes, the acceptance of various core substitution patterns was tested. Short substrates containing GCH and GUH (H= non G) triplets were compared using 3 different modified ribozymes. The acceptance of the U-4 2′-O-alkyl substituent is the greatest with GCA triplets while U-4 = 2'-deoxy-2'-amino uridine and U-4 = ribo uridine substituted ribozymes show a similar level of activity with NCH and NUH triplets. The results of this comparison are summarized in **Table 64.** In addition, a ribozyme construct in which ribo inosine replaces adenosine at positions 14 and 15.1 was tested which demonstrated cleavage activity.

Apart from the A-15.1 •U-16.1 to I-15 .1 •C-16.1 change that reverses the polarity of an important H-bond in the ribozyme structure, no other functional group changes at the 15.1 purine residue seem to be compatible with the requirements of efficient catalysis. The I-15.1 and A-15.1 ribozymes are equally suitable for practical applications because there are only minor differences in the acceptance of stabilizing residues.

Example 13: Activity of NCH Ribozyme to inhibit HER2 gene expression

Applicant has designed, synthesized and tested several NCH ribozymes and HH ribozymes targeted against HER2 RNA (see, for example, **Tables 31 and 34)** in cell proliferation assays.

Proliferation assay: The model proliferation assay used in the study can require a cell plating density of 2000 cells/well in 96-well plates and at least 2 cell doublings over a 5-day treatment period. To calculate cell density for proliferation assays, the FIPS (fluoro-imaging processing system) method well in the art was used. This method allows for cell density measurements after nucleic acids are stained with CyQuant® dye, and has the advantage of accurately measuring cell densities over a very wide range 1,000-100,000 cells/well in 96-well format.

Ribozymes (50-200 nM) were delivered in the presence of cationic lipid at 2.0 μg/mL and inhibition of proliferation was determined on day 5 post-treatment. Two full ribozyme screens were completed and 4 lead *HH* and 11 lead *NCH* ribozymes were chosen for further testing. Of the 15 lead Rzs chosen from primary screens, 4 *NCH* and 1

HH Rzs continued to inhibit cell proliferation in subsequent experiments. *NCH* Rzs against sites, 2001 (RPI No. 17236), 2783 (RPI No. 17249), 2939 (RPI No. 17251) or 3998 (RPI No. 17262) caused inhibition of proliferation ranging from 25-60% as compared to a scrambled control Rz (IA; RPI No. 17263). Of the five lead Rzs, the most efficacious is the *NCH* Rz (RPI No. 17251) against site 2939 of HER2 RNA. An example of results from cell culture assay is shown in Figure 3. Referring to Figure 3, NCH ribozymes and a HH ribozyme targeted against HER2 RNA are shown to cause significant inhibition of proliferation of cells. This shows that ribozymes, for instance, the NCH ribozymes are capable of inhibiting HER2 gene expression in mammalian cells.

<u>Example 14: Activity of NCH Ribozyme to inhibit PKC alpha gene expression</u>

The Protein Kinase C family contains twelve currently known isozymes divided into three classes: the classic, Ca^{++} dependent (PKCα, βI, βII, γ), the novel, non-Ca^{++} dependent (PKCδ, ε, μ, η, θ) and the atypical (PKC ξ, i/λ); all of which are serine/threonine kinases. These isozymes show distinct and overlapping tissue, cellular, and subcellular distribution. They aid in the regulation of cell growth and differentiation through their response to second messenger products of lipid metabolism (Blobe, *et al.*, 1996, *Cancer Surveys*, 27, 213-248). These second messengers include diacylglyceral (DAG), inositol-triphosphate (IP3), lysophospholipids, free fatty acids, and phosphatidate which act directly or in addition to changes in the Ca^{++} concentration. A simple model for PKCα activation follows a two step mechanism. First, membrane association of PKCα is through Ca^{++} and phospholipid interactions and second, the kinase is activated by interaction with DAG. An example of a signal cascade subsequent to PKC activation is PKC's phosphorylation of c-Raf, which phosphorylates MEK, which phosphorylates MAP, which phosphorylates transcription factors such as Jun and thereby activates a mitogenic program in the nucleus. There are numerous substrates for the various PKC's, one which for PKCα ultimately stimulates transcription factors that activate P-glycoprotein (P-gp) causing the multi-drug resistant phenotype (MDR) (Blobe, *et al.*, 1994, *Cancer and Metastasis Reviews*, 13, 411-431).

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PKC's have been implicated in tumor promotion since the discovery that these molecules can serve as receptors for tumor-promoting phorbol esters. An increase in PKC overexpression in numerous tumor cell lines and tumor tissues has also been demonstrated. PKC overexpression has been shown to be associated with increased invasion and metastasis in mouse Lewis lung carcinoma, mouse B16 melanoma (Lee *et al.*, 1997, *Molecular Carcinogenesis,* 18, 44-53), mouse mammary adenocarcinoma, mouse fibrosarcoma, human lung carcinoma (Wang and Liu, 1998, *Acta Pharmacologica Sinica,* 19, 265-268), human bladder carcinoma, human pancreatic cancer (Denham *et al.*, 1998, *Surgery,* 124, 218-223), and human gastric cancer (Dean *et al.*, 1996, *Cancer Research,* 56, 3499-3507). Mounting evidence suggests PKCα can stimulate adhesion molecule expression and can directly act on these membrane bound species as substrates, thereby modulating cellular adhesion to the extracellular matrix and increasing metastatic potential. Furthermore, human surgical specimens have demonstrated elevated PKC in breast tumors, thyroid carcinomas and melanomas (Becker *et al.*, 1990, *Oncogene,* 5, 1133-1139).

Utz *et al.*, 1994, *Int. J. Cancer,* 57, 104-110, describe a cell proliferation assay in which small molecule inhibitors of PKC demonstrate anti-proliferative activity in CCRF-VCR 1000 and KB-8511 cells with the multidrug resistant (MDR) phenotype. PKCα is overexpressed in tumor tissues that express the MDR phenotype. This phenotype is associated with the expression of a 170 kDa broad specificity drug efflux pump, P-gp. PKCα phosphorylation of P-gp has been shown *in vitro*. In addition, PKC expression correlates with resistance to doxorubicin and high P-gp levels in human renal carcinoma and non-small cell lung carcinoma. Inhibitors of PKC partially reverse the MDR phenotype and decrease phosphorylation of P-gp (Caponigro *et al.*, 1997, *Anti-Cancer Drugs,* 8, 26-33).

Dean *et al.*, 1994, *Journal of Biological Chemistry,* 269, 16416-24, describe cell culture studies in which antisense targeting of PKC α resulted in the potent inhibition of mRNA and protein expression in human lung carcinoma (A549) cells. In this study, PKC α inhibition resulted in the reduced induction of intercellular adhesion molecule 1 (ICAM-1) mRNA by phorbol esters.

Yano *et al.*, 1999, *Endocrinology*, 140, 4622-4632, describe a cell proliferation study in which down regulation of different PKC isoforms, including PKCα, results in the inhibition of insulin like growth factor I induced vascular smooth muscle cell proliferation, migration, and gene expression.

Wang *et al.*, 1999, *Experimental Cell Research*, 250, 253-263, describe cell culture studies in which antisense inhibition of PKCα results in the reversal of the transformed phenotype in human lung carcinoma (LTEPa-2) cells. In this study, the amounts of PKCα protein and total PKC activity were decreased when compared to control cells.

Sioud and Sorensen, 1998, *Nature Biotechnology*, 16, 556-561, describe hammerhead ribozyme inhibition of PKCα in rat glioma cell lines (BT4C and BT4Cn). This study demonstrated inhibition of malignant glioma cell proliferation along with the inhibition of regulatory Bcl-x_L protein expression. Bcl-x_L is overexpressed in glioma cells and is an apoptosis inhibitor. The ribozyme mediated inhibition of cell proliferation presumably results from apoptosis induction of transformed glioma cells through suppression of PKCα and Bcl-x_L (Leirdal and Sioud, 1999, *British J. of Cancer*, 80, 1558-1564).

Animal Models

Evaluating the efficacy of anti-PKCα agents in animal models is an important prerequisite to human clinical trials. A variety of mouse xenograft models using human tumor cell lines have been developed using cell lines which express high levels of PKCα protein. McGraw *et al*, 1997, *Anti-Cancer Drug Design*, 12, 315-326, describe mouse xenograft models using human breast (MDA MB-321), prostate (Du-145), colon (Colo 205, WiDr), lung (NCI H69, H209, J460, H520, A549), bladder (T-24), and melanoma (SK-mel 1) carcinoma cells. Antisense oligonucleotides targeting PKCα administered intravenously following s.c. transplanted tumor cells resulted in dose dependant decreases in tumor size when compared to controls in most cases. Similar studies using T-24 bladder carcinoma, non-small cell lung carcinoma (A549), and Colo 205 colon carcinoma mouse xenografts are described in Dean *et al*, 1996, *Biochemical Society Transactions*, 24, 623. Sioud and Sorensen, 1998, *Nature Biotechnology*, 16, 556-561, describe a rat model in which inbred syngeneic BDIX rats were inoculated subcutaneously with BT4Cn glioma cells. After approximately three weeks, rats were treated with a single injection of

ribozyme targeting PKCα resulting in inhibition of tumor growth as determined by tumor size and/or weight when compared to controls. The above studies provide proof that inhibition of PKCα expression by anti-PKCα agents causes inhibition of tumor growth in animals. Lead anti-PKCα ribozymes chosen from *in vitro* assays can be further tested in mouse xenograft models. Ribozymes can be first tested alone and then in combination with standard chemotherapies.

Animal Model Development

Human lung (A549, NCI H520) tumor and breast (MDA-MB 231) cell lines can be characterized to establish their growth curves in mice. These cell lines are been implanted into both nude and SCID mice and primary tumor volumes are measured 3 times per week. Growth characteristics of these tumor lines using a Matrigel implantation format can also be established. In addition, the use of other cell lines that have been engineered to express high levels of PKCα can also be used. The tumor cell line(s) and implantation method that supports the most consistent and reliable tumor growth can be used in animal studies to test promising PKCα ribozyme(s). Ribozymes can be administered by daily subcutaneous injection or by continuous subcutaneous infusion from Alzet mini osmotic pumps beginning 3 days after tumor implantation and continuing for the duration of the study. Group sizes of at least 10 animals are employed. Efficacy is determined by statistical comparison of tumor volume of ribozyme-treated animals to a control group of animals treated with saline alone. Because the growth of these tumors is generally slow (45-60 days), an initial endpoint will be the time in days it takes to establish an easily measurable primary tumor (i.e. 50-100 mm^3) in the presence or absence of ribozyme treatment.

Clinical Summary

Overview

Ribozymes targeting PKCα have strong potential to develop into useful therapeutics directed towards numerous cancer types. Lung cancer is the leading cause of cancer deaths for both men and women in the USA. The incidence of lung cancer in the United States is ~172,000 cases per year, accounting for 14% of cancer diagnoses. Approximately 158,000 die each year of lung cancer, accounting for 28% of all cancer deaths. Numerous other

indications exist including cancers of the bladder, colon, breast, prostate, and ovary in addition to melanoma and glioblastoma.

McGraw *et al.*, 1997, *Anti-Cancer Drug Design,* 12, 315-326, describe a Phase I trial for ISIS 3521/CGP 64128A, a PKC alpha antisense construct. In this trial, ISIS 3521/CGP 64128A was administered as either a two-hour i.v. infusion three times per week for three consecutive weeks, or as a continuous i.v. infusion for twenty-one consecutive days. The authors report that patients demonstrated excellent tolerance to the antisense compound when administered at doses of up to 2.5 mg/kg by the two-hour i.v. infusion and at 1.5 mg/kg/day by continuous i.v. infusion. In patients receiving the two-hour i.v. infusion schedule, the post-infusion plasma concentration of the compound increased proportional to the dose, and metabolites were determined to have been cleared rapidly from plasma with a half-life of thirty to forty-five minutes. These metabolites were composed of chain-shortened oligonucleotides, consistent with exonuclease-mediated degradation. No evidence of accumulation, induction, or inhibition of metabolism was found after the administration of repetitive doses.

Therapy

Treatment options for lung cancer are determined by the type and stage of the cancer and include surgery, radiation therapy, and chemotherapy. For many localized cancers, surgery is usually the treatment of choice. Because the disease has usually spread by the time it is discovered, radiation therapy and chemotherapy are often needed in combination with surgery. Chemotherapy alone or combined with radiation has replaced surgery as the treatment of choice for small cell lung cancer; on this regimen, a large percentage of patients experience remission, which in some cases is long-lasting. The 1-year relative survival rates for lung cancer have increased from 32% in 1973 to 41% in 1994, largely due to improvements in surgical techniques. The 5-year relative survival rate for all stages combined is only 14%. The survival rate is 50% for cases detected when the disease is still localized, but only 15% of lung cancers are discovered that early.

Common chemotherapies include various combinations of cytotoxic drugs to kill the cancer cells. These drugs include paclitaxel (Taxol), docetaxel, cisplatin, methotrexate, cyclophosphamide, doxorubin, fluorouracil *etc.* Significant toxicities are associated with these cytotoxic therapies. Well-characterized toxicities include nausea and vomiting,

myelosuppression, alopecia and mucosity. Serious cardiac problems are also associated with certain of the combinations, *e.g.* doxorubin and paclitaxel, but are less common.

Applicant has designed several NCH ribozymes targeted against PKCα RNA (Genebank accession No NM_002737) (see, for example, **Table 63**). These ribozymes are used first in a proliferation assay that is used to select ribozyme leads.

Proliferation assay: The model proliferation assay useful in the study can require a cell plating density of 2000 cells/well in 96-well plates and at least 2 cell doublings over a 5-day treatment period. To calculate cell density for proliferation assays, the FIPS (fluoro-imaging processing system) method well known in the art can be used. This method allows for cell density measurements after nucleic acids are stained with CyQuant® dye, and has the advantage of accurately measuring cell densities over a very wide range 1,000-100,000 cells/well in 96-well format.

Ribozymes (50-200 nM) are delivered in the presence of cationic lipid at 2.0 μg/mL and inhibition of proliferation is determined on day 5 post-treatment. Two full ribozyme screens are usually completed and lead ribozymes are chosen for further testing. Of the lead ribozymes chosen from primary screens, ribozymes which continue to inhibit cell proliferation in subsequent experiments are selected for PKCα RNA and protein inhibition studies.

Example 15: Nucleoside Triphosphates and their incorporation into oligonucleotides

The synthesis of nucleotide triphosphates and their incorporation into nucleic acids using polymerase enzymes has greatly assisted in the advancement of nucleic acid research. The polymerase enzyme utilizes nucleotide triphosphates as precursor molecules to assemble oligonucleotides. Each nucleotide is attached by a phosphodiester bond formed through nucleophilic attack by the 3' hydroxyl group of the oligonucleotide's last nucleotide onto the 5' triphosphate of the next nucleotide. Nucleotides are incorporated one at a time into the oligonucleotide in a 5' to 3' direction. This process allows RNA to be produced and amplified from virtually any DNA or RNA templates.

Most natural polymerase enzymes incorporate standard nucleotide triphosphates into nucleic acid. For example, a DNA polymerase incorporates dATP, dTTP, dCTP, and dGTP into DNA and an RNA polymerase generally incorporates ATP, CTP, UTP, and

GTP into RNA. There are however, certain polymerases that are capable of incorporating non-standard nucleotide triphosphates into nucleic acids (Joyce, 1997, *PNAS* 94, 1619-1622, Huang et al., *Biochemistry* 36, 8231-8242).

Before nucleosides can be incorporated into RNA transcripts using polymerase enzymes they must first be converted into nucleotide triphosphates which can be recognized by these enzymes. Phosphorylation of unblocked nucleosides by treatment with $POCl_3$ and trialkyl phosphates was shown to yield nucleoside 5'-phosphorodichloridates (Yoshikawa *et al.*, 1969, *Bull. Chem. Soc.(Japan)* 42, 3505). Adenosine or 2'-deoxyadenosine 5'-triphosphate was synthesized by adding an additional step consisting of treatment with excess tri-n-butylammonium pyrophosphate in DMF followed by hydrolysis (Ludwig, 1981, *Acta Biochim. et Biophys. Acad. Sci. Hung.* 16, 131-133).

Non-standard nucleotide triphosphates are not readily incorporated into RNA transcripts by traditional RNA polymerases. Mutations have been introduced into RNA polymerase to facilitate incorporation of deoxyribonucleotides into RNA (Sousa & Padilla, 1995, *EMBO J.* 14,4609-4621, Bonner *et al.*, 1992, *EMBO J.* 11, 3767-3775, Bonner et al., 1994, *J. Biol. Chem.* 42, 25120-25128, Aurup *et al.*, 1992, *Biochemistry* 31, 9636-9641).

McGee *et al.*, International PCT Publication No. WO 95/35102, describes the incorporation of 2'-NH_2-NTP's, 2'-F-NTP's, and 2'-deoxy-2'-benzyloxyamino UTP into RNA using bacteriophage T7 polymerase.

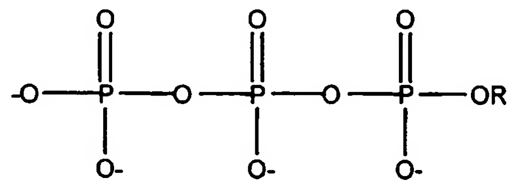
Wieczorek *et al.*, 1994, *Bioorganic & Medicinal Chemistry Letters* 4, 987-994, describes the incorporation of 7-deaza-adenosine triphosphate into an RNA transcript using bacteriophage T7 RNA polymerase.

Lin *et al.*, 1994, *Nucleic Acids Research* 22, 5229-5234, reports the incorporation of 2'-NH_2-CTP and 2'-NH_2-UTP into RNA using bacteriophage T7 RNA polymerase and polyethylene glycol containing buffer. The article describes the use of the polymerase synthesized RNA for *in vitro* selection of aptamers to human neutrophil elastase (HNE).

This invention relates to novel nucleotide triphosphate (NTP) molecules, and their incorporation into nucleic acid molecules, including nucleic acid catalysts. The NTPs of the instant invention are distinct from other NTPs known in the art. The invention further relates to incorporation of these nucleotide triphosphates into oligonucleotides using an RNA polymerase; the invention further relates to novel transcription conditions for the

incorporation of modified (non-standard) and unmodified NTP's, into nucleic acid molecules. Further, the invention relates to methods for synthesis of novel NTP's

In a first aspect, the invention features NTP's having the formula triphosphate-OR, for example the following formula 3:



where R is any nucleoside; specifically the nucleosides 2'-*O*-methyl-2,6-diaminopurine riboside; 2'-deoxy-2'amino-2,6-diaminopurine riboside; 2'-(*N*-alanyl) amino-2'-deoxy-uridine; 2'-(*N*-phenylalanyl)amino-2'-deoxy-uridine; 2'-deoxy -2'-(*N*-β-alanyl) amino ; 2'-deoxy-2'-(lysiyl) amino uridine; 2'-*C*-allyl uridine; 2'-*O*-amino-uridine; 2'-*O*-methylthiomethyl adenosine; 2'-*O*-methylthiomethyl cytidine ; 2'-*O*-methylthiomethyl guanosine; 2'-*O*-methylthiomethyl-uridine; 2'-deoxy-2'-(*N*-histidyl) amino uridine; 2'-deoxy-2'-amino-5-methyl cytidine; 2'-(*N*-β-carboxamidine-β-alanyl)amino-2'-deoxy-uridine; 2'-deoxy-2'-(N-β-alanyl)-guanosine; 2'-*O*-amino-adenosine; 2'-(*N*-lysyl)amino-2'-deoxy-cytidine; 2'-Deoxy -2'-(L-histidine) amino Cytidine; 5-Imidazoleacetic acid 2'-deoxy uridine, 5-[3-(N-4-imidazoleacetyl)aminopropynyl]-2'-O-methyl uridine, 5-(3-aminopropynyl)-2'-O-methyl uridine, 5-(3-aminopropyl)-2'-O-methyl uridine, 5-[3-(N-4-imidazoleacetyl)aminopropyl]-2'-O-methyl uridine, 5-(3-aminopropyl)-2'-deoxy-2-fluoro uridine, 2'-Deoxy-2'-(β-alanyl-L-histidyl)amino uridine, 2'-deoxy-2'-β-alaninamido-uridine, 3-(2'-deoxy-2'-fluoro-β-D-ribofuranosyl)piperazino[2,3-D]pyrimidine-2-one, 5-[3-(N-4-imidazoleacetyl)aminopropyl]-2'-deoxy-2'-fluoro uridine, 5-[3-(N-4-imidazoleacetyl)aminopropynyl]-2'-deoxy-2'-fluoro uridine, 5-E-(2-carboxyvinyl-2'-deoxy-2'-fluoro uridine, 5-[3-(N-4-aspartyl)aminopropynyl-2'-fluoro uridine, 5-(3-aminopropyl)-2'-deoxy-2-fluoro cytidine, and 5-[3-(N-4-succynyl)aminopropyl-2'-deoxy-2-fluoro cytidine.

In a second aspect, the invention features inorganic and organic salts of the nucleoside triphosphates of the instant invention.

In a third aspect, the invention features a process for the synthesis of pyrimidine nucleotide triphosphate (such as UTP, 2'-*O*-MTM-UTP, dUTP and the like) including the steps of monophosphorylation where the pyrimidine nucleoside is contacted with a mixture having a phosphorylating agent (such as phosphorus oxychloride, phospho-tris-triazolides, phospho-tris-triimidazolides and the like), trialkyl phosphate (such as triethylphosphate or trimethylphosphate or the like) and a hindered base (such as dimethylaminopyridine, DMAP and the like) under conditions suitable for the formation of pyrimidine monophosphate; and pyrophosphorylation where the pyrimidine monophosphate is contacted with a pyrophosphorylating reagent (such as tributylammonium pyrophosphate) under conditions suitable for the formation of pyrimidine triphosphates.

By "nucleotide triphosphate" or "NTP" is meant a nucleoside bound to three inorganic phosphate groups at the 5' hydroxyl group of the modified or unmodified ribose or deoxyribose sugar where the 1' position of the sugar may comprise a nucleic acid base or hydrogen. The triphosphate portion may be modified to include chemical moieties which do not destroy the functionality of the group (*i.e.,* allow incorporation into an RNA molecule).

In another preferred embodiment, nucleotide triphosphates (NTPs) of the instant invention are incorporated into an oligonucleotide using an RNA polymerase enzyme. RNA polymerases include but are not limited to mutated and wild type versions of bacteriophage T7, SP6, or T3 RNA polymerases. Applicant has also found that the NTPs of the present invention can be incorporated into oligonucleotides using certain DNA polymerases, such as Taq polymerase.

In yet another preferred embodiment, the invention features a process for incorporating modified NTP's into an oligonucleotide including the step of incubating a mixture having a DNA template, RNA polymerase, NTP, and an enhancer of modified NTP incorporation under conditions suitable for the incorporation of the modified NTP into the oligonucleotide.

By "enhancer of modified NTP incorporation" is meant a reagent which facilitates the incorporation of modified nucleotides into a nucleic acid transcript by an RNA polymerase. Such reagents include, but are not limited to, methanol, LiCl, polyethylene glycol (PEG), diethyl ether, propanol, methyl amine, ethanol, and the like.

In another preferred embodiment, the modified nucleotide triphosphates can be incorporated by transcription into a nucleic acid molecules including enzymatic nucleic acid, antisense, 2-5A antisense chimera, oligonucleotides, triplex forming oligonucleotide (TFO), aptamers and the like (Stull *et al.,* 1995 *Pharmaceutical Res.* 12, 465).

By "triplex forming oligonucleotides (TFO)" it is meant an oligonucleotide that can bind to a double-stranded DNA in a sequence-specific manner to form a triple-strand helix. Formation of such triple helix structure has been shown to inhibit transcription of the targeted gene (Duval-Valentin *et al.,* 1992 *Proc. Natl. Acad. Sci. USA* 89, 504).

In yet another preferred embodiment, the modified nucleotide triphosphates of the instant invention can be used for combinatorial chemistry or *in vitro* selection of nucleic acid molecules with novel function. Modified oligonucleotides can be enzymatically synthesized to generate libraries for screening.

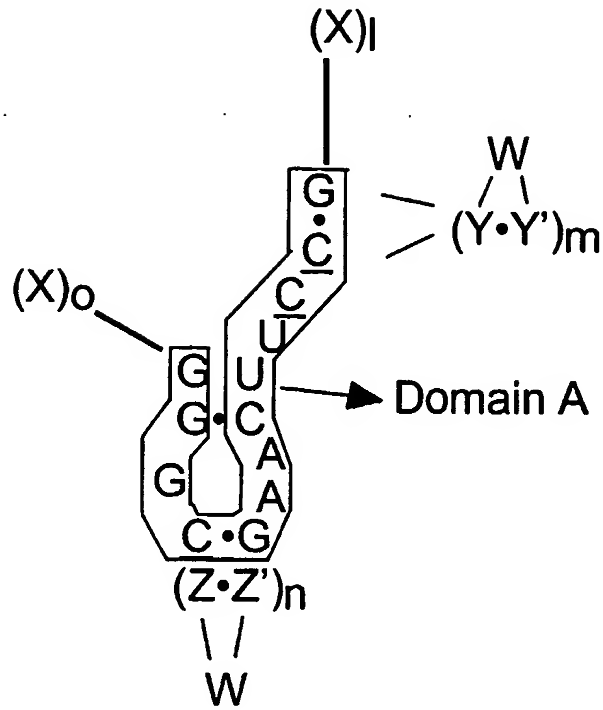
In another preferred embodiment, the invention features nucleic acid based techniques (*e.g.*, enzymatic nucleic acid molecules), antisense nucleic acids, 2-5A antisense chimeras, triplex DNA, antisense nucleic acids containing RNA cleaving chemical groups) isolated using the methods described in this invention and methods for their use to diagnose, down regulate or inhibit gene expression.

In yet another preferred embodiment, the invention features enzymatic nucleic acid molecules targeted against HER2 RNA, specifically including ribozymes in the class II (zinzyme) motif.

Targets, for example HER2 RNA, for useful ribozymes and antisense nucleic acids can be determined, for example, as described in Draper *et al.*, WO 93/23569; Sullivan *et al.*, WO 93/23057; Thompson *et al.*, WO 94/02595; Draper *et al.*, WO 95/04818; McSwiggen *et al.*, US Patent Nos. 5,525,468 and 5,646,042, all are hereby incorporated by reference herein in their totalities. Other examples include the following PCT applications, which concern inactivation of expression of disease-related genes: WO 95/23225, and WO 95/13380; all of which are incorporated by reference herein.

In yet another preferred embodiment, the invention features a process for incorporating a plurality of compounds of formula 3.

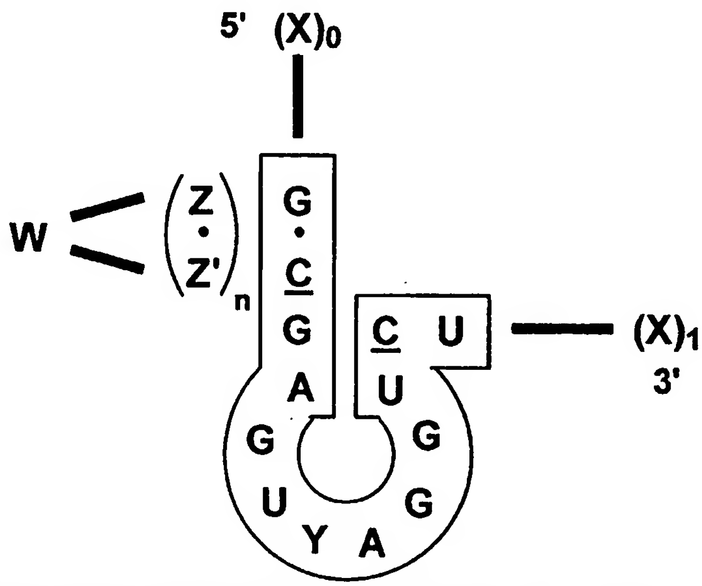
In yet another embodiment, the invention features a nucleic acid molecule with catalytic activity having formula 4:



In the formula shown above X, Y, and Z represent independently a nucleotide or a non-nucleotide linker, which may be same or different; • indicates hydrogen bond formation between two adjacent nucleotides which may or may not be present; Y' is a nucleotide complementary to Y; Z' is a nucleotide complementary to Z; l is an integer greater than or equal to 3 and preferably less than 20, more specifically 4, 5, 6, 7, 8, 9, 10, 11, 12, or 15; m is an integer greater than 1 and preferably less than 10, more specifically 2, 3, 4, 5, 6, or 7; n is an integer greater than 1 and preferably less than 10, more specifically 3, 4, 5, 6, or 7; o is an integer greater than or equal to 3 and preferably less than 20, more specifically 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, or 15; l and o may be the same length ($l = o$) or different lengths ($l \neq o$); each X(l) and X(o) are oligonucleotides which are of sufficient length to stably interact independently with a target nucleic acid sequence (the target can be an RNA, DNA or RNA/DNA mixed polymers); W is a linker of ≥ 2 nucleotides in length or may be a non-nucleotide linker; A, U, C, and G represent the nucleotides; G is a nucleotide, preferably 2'-O-methyl or ribo; A is a nucleotide, preferably 2'-O-methyl or ribo; U is a nucleotide, preferably 2'-amino (*e.g.*, 2'-NH_2 or 2'-O- NH_2), 2'-O-methyl or ribo; <u>C</u> represents a nucleotide, preferably 2'-amino (*e.g.*, 2'-NH_2 or 2'-O-

NH_2), and _____ represents a chemical linkage (*e.g.* a phosphate ester linkage, amide linkage, phosphorothioate, phosphorodithioate or others known in the art).

In yet another embodiment, the invention features a nucleic acid molecule with catalytic activity having formula 5:



In the formula shown above **X**, **Y**, and **Z** represent independently a nucleotide or a non-nucleotide linker, which may be same or different; • indicates hydrogen bond formation between two adjacent nucleotides which may or may not be present; **Z'** is a nucleotide complementary to **Z**; **l** is an integer greater than or equal to 3 and preferably less than 20, more specifically 4, 5, 6, 7, 8, 9, 10, 11, 12, or 15; **n** is an integer greater than 1 and preferably less than 10, more specifically 3, 4, 5, 6, or 7; **o** is an integer greater than or equal to 3 and preferably less than 20, more specifically 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, or 15; **l** and **o** may be the same length (**l** = **o**) or different lengths (**l** ≠ **o**); each $\mathbf{X_{(l)}}$ and $\mathbf{X_{(o)}}$ are oligonucleotides which are of sufficient length to stably interact independently with a target nucleic acid sequence (the target can be an RNA, DNA or RNA/DNA mixed polymers); $\mathbf{X_{(o)}}$ preferably has a **G** at the 3'-end, $\mathbf{X_{(l)}}$ preferably has a **G** at the 5'-end; **W** is a linker of ≥ 2 nucleotides in length or may be a non-nucleotide linker; **Y** is a linker of ≥ 1 nucleotides in length, preferably **G**, **5'-CA-3'**, or **5'-CAA-3'**, or may be a non-nucleotide linker; **A**, **U**, **C**, and **G** represent nucleotides; **G** is a nucleotide, preferably 2'-*O*-methyl, 2'-deozy-2'-fluoro, or 2'-OH; **A** is a nucleotide, preferably 2'-*O*-methyl, 2'-deozy-2'-

fluoro, or 2'-OH; U is a nucleotide, preferably 2'-O-methyl, 2'-deozy-2'-fluoro, or 2'-OH; C represents a nucleotide, preferably 2'-amino (*e.g.*, 2'-NH_2 or 2'-O- NH_2, and ________ represents a chemical linkage (*e.g.* a phosphate ester linkage, amide linkage, phosphorothioate, phosphorodithioate or others known in the art).

The enzymatic nucleic acid molecules of Formula 4 and Formula 5 may independently comprise a cap structure which may independently be present or absent.

In yet another preferred embodiment, the 3'-cap is selected from a group comprising, 4',5'-methylene nucleotide; 1-(beta-D-erythrofuranosyl) nucleotide; 4'-thio nucleotide; carbocyclic nucleotide; 5'-amino-alkyl phosphate; 1,3-diamino-2-propyl phosphate; 3-aminopropyl phosphate; 6-aminohexyl phosphate; 1,2-aminododecyl phosphate; hydroxypropyl phosphate; 1,5-anhydrohexitol nucleotide; L-nucleotide; alpha-nucleotide; modified base nucleotide; phosphorodithioate; *threo*-pentofuranosyl nucleotide; acyclic 3',4'-seco nucleotide; 3,4-dihydroxybutyl nucleotide; 3,5-dihydroxypentyl nucleotide; 5'-5'-inverted nucleotide moiety; 5'-5'-inverted abasic moiety; 5'-phosphoramidate; 5'-phosphorothioate; 1,4-butanediol phosphate 5'-amino; bridging and/or non-bridging 5'-phosphoramidate, phosphorothioate and/or hosphorodithioate; bridging or non bridging methylphosphonate and 5'-mercapto moieties (for more details, see Beaucage and Iyer, 1993, *Tetrahedron* 49, 1925; incorporated by reference herein).

In another aspect, the invention provides mammalian cells containing one or more nucleic acid molecules and/or expression vectors of this invention. The one or more nucleic acid molecules may independently be targeted to the same or different sites.

Nucleotide Synthesis

Addition of dimethylaminopyridine (DMAP) to the phosphorylation protocols known in the art can greatly increase the yield of nucleotide monophosphates while decreasing the reaction time. Synthesis of the nucleosides of the invention have been described in several publications and Applicants previous applications (Beigelman *et al.*, International PCT publication No. WO 96/18736; Dudzcy *et al.*, Int. PCT Pub. No. WO 95/11910; Usman *et al.*, Int. PCT Pub. No. WO 95/13378; Matulic-Adamic *et al.*, 1997, *Tetrahedron Lett.* 38, 203; Matulic-Adamic *et al.*, 1997, *Tetrahedron Lett.* 38, 1669; all of which are incorporated herein by reference). These nucleosides are dissolved in triethyl phosphate and chilled in an ice bath. Phosphorus oxychloride ($POCl_3$) is then added

followed by the introduction of DMAP. The reaction is then warmed to room temperature and allowed to proceed for 5 hours. This reaction allows the formation of nucleotide monophosphates which can then be used in the formation of nucleotide triphosphates. Tributylamine is added followed by the addition of anhydrous acetonitrile and tributylammonium pyrophosphate. The reaction is then quenched with TEAB and stirred overnight at room temperature (about 20°C). The triphosphate is purified using Sephadex® column purification or equivalent and/or HPLC and the chemical structure is confirmed using NMR analysis. Those skilled in the art will recognize that the reagents, temperatures of the reaction, and purification methods can easily be alternated with substitutes and equivalents and still obtain the desired product.

Nucleotide Triphosphates

The invention provides nucleotide triphosphates which can be used for a number of different functions. The nucleotide triphosphates formed from nucleosides found in **Table 45** are unique and distinct from other nucleotide triphosphates known in the art. Incorporation of modified nucleotides into DNA or RNA oligonucleotides can alter the properties of the molecule. For example, modified nucleotides can hinder binding of nucleases, thus increasing the chemical half-life of the molecule. This is especially important if the molecule is to be used for cell culture or *in vivo*. It is known in the art that the introduction of modified nucleotides into these molecules can greatly increase the stability and thereby the effectiveness of the molecules (Burgin *et al.*, 1996, *Biochemistry* 35, 14090-14097; Usman *et al.*, 1996, *Curr. Opin. Struct. Biol.* 6, 527-533).

Modified nucleotides are incorporated using either wild type or mutant polymerases. For example, mutant T7 polymerase is used in the presence of modified nucleotide triphosphate(s), DNA template and suitable buffers. Those skilled in the art will recognize that other polymerases and their respective mutant versions can also be utilized for the incorporation of NTP's of the invention. Nucleic acid transcripts were detected by incorporating radiolabelled nucleotides (α-^{32}P NTP). The radiolabeled NTP contained the same base as the modified triphosphate being tested. The effects of methanol, PEG and LiCl were tested by adding these compounds independently or in combination. Detection and quantitation of the nucleic acid transcripts was performed using a Molecular Dynamics

PhosphorImager. Efficiency of transcription was assessed by comparing modified nucleotide triphosphate incorporation with all-ribonucleotide incorporation control. Wild-type polymerase was used to incorporate NTP's using the manufacturer's buffers and instructions (Boehringer Mannheim).

Transcription Conditions

Incorporation rates of modified nucleotide triphosphates into oligonucleotides can be increased by adding to traditional buffer conditions, several different enhancers of modified NTP incorporation. Applicant has utilized methanol and LiCl in an attempt to increase incorporation rates of dNTP using RNA polymerase. These enhancers of modified NTP incorporation can be used in different combinations and ratios to optimize transcription. Optimal reaction conditions differ between nucleotide triphosphates and can readily be determined by standard experimentation. Overall, however, Applicant has found that inclusion of enhancers of modified NTP incorporation such as methanol or inorganic compound such as lithium chloride increase the mean transcription rates.

Applicant synthesized pyrimidine nucleotide triphosphates using DMAP in the reaction. For purines, applicant utilized standard protocols previously described in the art (Yoshikawa *et al supra;*. Ludwig, *supra*). Described below is one example of a pyrimdine nucleotide triphosphate and one purine nucleotide triphosphate synthesis.

Synthesis of purine nucleotide triphosphates: 2'-*O*-methyl-guanosine-5'-triphosphate

2'-*O*-methyl guanosine nucleoside (0.25 grams, 0.84 mmol) was dissolved in triethyl phosphate (5.0) ml by heating to 100°C for 5 minutes. The resulting clear, colorless solution was cooled to 0°C using an ice bath under an argon atmosphere. Phosphorous oxychloride (1.8 eq., 0.141 ml) was then added to the reaction mixture with vigorous stirring. The reaction was monitored by HPLC, using a sodium perchlorate gradient. After 5 hours at 0°C, tributylamine (0.65 ml) was added followed by the addition of anhydrous acetonitrile (10.0 ml), and after 5 minutes (reequilibration to 0°C) tributylammonium pyrophosphate (4.0 eq., 1.53 g) was added. The reaction mixture was quenched with 20 ml of 2M TEAB after 15 minutes at 0°C (HPLC analysis with above conditions showed consumption of monophosphate at 10 minutes) then stirred overnight at room temperature, the mixture was evaporated *in vacuo* with methanol co-evaporation

(4x) then diluted in 50 ml 0.05M TEAB. DEAE sephadex purification was used with a gradient of 0.05 to 0.6 M TEAB to obtain pure triphosphate (0.52 g, 66.0% yield) (elutes around 0.3M TEAB); the purity was confirmed by HPLC and NMR analysis.

Synthesis of Pyrimidine nucleotide triphosphates: 2'-*O*-methylthiomethyl-uridine-5'-triphosphate

2'-*O*-methylthiomethyl uridine nucleoside (0.27 grams, 1.0 mmol) was dissolved in triethyl phosphate (5.0 ml). The resulting clear, colorless solution was cooled to 0°C with an ice bath under an argon atmosphere. Phosphorus oxychloride (2.0 eq., 0.190 ml) was then added to the reaction mixture with vigorous stirring. Dimethylaminopyridine (DMAP, 0.2eq., 25 mg) was added, the solution warmed to room temperature and the reaction was monitored by HPLC, using a sodium perchlorate gradient. After 5 hours at 20°C, tributylamine (1.0 ml) was added followed by anhydrous acetonitrile (10.0 ml), and after 5 minutes tributylammonium pyrophosphate (4.0 eq., 1.8 g) was added. The reaction mixture was quenched with 20 ml of 2M TEAB after 15 minutes at 20°C (HPLC analysis with above conditions showed consumption of monophosphate at 10 minutes) then stirred overnight at room temperature. The mixture was evaporated *in vacuo* with methanol co-evaporation (4x) then diluted in 50 ml 0.05M TEAB. DEAE fast flow Sepharose purification with a gradient of 0.05 to 1.0 M TEAB was used to obtain pure triphosphate (0.40 g, 44% yield) (elutes around 0.3M TEAB) as determined by HPLC and NMR analysis.

Utilization of DMAP in Uridine 5'-Triphosphate Synthesis

The reactions were performed on 20 mg aliquots of nucleoside dissolved in 1 ml of triethyl phosphate and 19 ul of phosphorus oxychloride. The reactions were monitored at 40 minute intervals automatically by HPLC to generate yield-of-product curves at times up to 18 hours. A reverse phase column and ammonium acetate/ sodium acetate buffer system (50mM & 100mM respectively at pH 4.2) was used to separate the 5', 3', 2' monophosphates (the monophosphates elute in that order) from the 5'-triphosphate and the starting nucleoside. The data is shown in **Table 46**. These conditions doubled the product yield and resulted in a 10-fold improvement in the reaction time to maximum yield (1200 minutes down to 120 minutes for a 90% yield). Selectivity for 5'-monophosphorylation

was observed for all reactions. Subsequent triphosphorylation occurred in nearly quantitative yield.

Materials Used in Bacteriophage T7 RNA Polymerase Reactions

Buffer 1: Reagents are mixed together to form a 10X stock solution of buffer 1 (400 mM Tris-Cl [pH 8.1], 200 mM $MgCl_2$, 100 mM DTT, 50 mM spermidine, and 0.1% triton® X-100). Prior to initiation of the polymerase reaction methanol, LiCl is added and the buffer is diluted such that the final reaction conditions for condition 1 consisted of : 40mM tris (pH 8.1), 20mM $MgCl_2$, 10 mM DTT, 5 mM spermidine, 0.01% triton® X-100, 10% methanol, and 1 mM LiCl.

BUFFER 2: Reagents are mixed together to form a 10X stock solution of buffer 2 (400 mM Tris-Cl [pH 8.1], 200 mM $MgCl_2$, 100 mM DTT, 50 mM spermidine, and 0.1% triton® X-100). Prior to initiation of the polymerase reaction PEG, LiCl is added and the buffer is diluted such that the final reaction conditions for buffer 2 consisted of : 40mM tris (pH 8.1), 20mM $MgCl_2$, 10 mM DTT, 5 mM spermidine, 0.01% triton® X-100, 4% PEG, and 1 mM LiCl.

BUFFER 3: Reagents are mixed together to form a 10X stock solution of buffer 3 (400 mM Tris-Cl [pH 8.0], 120 mM $MgCl_2$, 50 mM DTT, 10 mM spermidine and 0.02% triton® X-100). Prior to initiation of the polymerase reaction PEG is added and the buffer is diluted such that the final reaction conditions for buffer 3 consisted of : 40mM tris (pH 8.0), 12 mM $MgCl_2$, 5 mM DTT, 1 mM spermidine, 0.002% triton® X-100, and 4% PEG.

BUFFER 4: Reagents are mixed together to form a 10X stock solution of buffer 4 (400 mM Tris-Cl [pH 8.0], 120 mM $MgCl_2$, 50 mM DTT, 10 mM spermidine and 0.02% triton® X-100). Prior to initiation of the polymerase reaction PEG, methanol is added and the buffer is diluted such that the final reaction conditions for buffer 4 consisted of : 40mM tris (pH 8.0), 12 mM $MgCl_2$, 5 mM DTT, 1 mM spermidine, 0.002% triton® X-100, 10% methanol, and 4% PEG.

BUFFER 5: Reagents are mixed together to form a 10X stock solution of buffer 5 (400 mM Tris-Cl [pH 8.0], 120 mM $MgCl_2$, 50 mM DTT, 10 mM spermidine and 0.02% triton® X-100). Prior to initiation of the polymerase reaction PEG, LiCl is added and the buffer is diluted such that the final reaction conditions for buffer 5 consisted of : 40mM

tris (pH 8.0), 12 mM $MgCl_2$, 5 mM DTT, 1 mM spermidine, 0.002% triton® X-100, 1 mM LiCl and 4% PEG.

BUFFER 6: Reagents are mixed together to form a 10X stock solution of buffer 6 (400 mM Tris-Cl [pH 8.0], 120 mM $MgCl_2$, 50 mM DTT, 10 mM spermidine and 0.02% triton® X-100). Prior to initiation of the polymerase reaction PEG, methanol is added and the buffer is diluted such that the final reaction conditions for buffer 6 consisted of : 40mM tris (pH 8.0), 12 mM $MgCl_2$, 5 mM DTT, 1 mM spermidine, 0.002% triton® X-100, 10% methanol, and 4% PEG.

BUFFER 7: Reagents are mixed together to form a 10X stock solution of buffer 6 (400 mM Tris-Cl [pH 8.0], 120 mM $MgCl_2$, 50 mM DTT, 10 mM spermidine and 0.02% triton® X-100). Prior to initiation of the polymerase reaction PEG, methanol and LiCl is added and the buffer is diluted such that the final reaction conditions for buffer 6 consisted of : 40mM tris (pH 8.0), 12 mM $MgCl_2$, 5 mM DTT, 1 mM spermidine, 0.002% triton® X-100, 10% methanol, 4% PEG, and 1 mM LiCl.

Screening of Modified nucleotide triphosphates with Mutant T7 RNA Polymerase

Modified nucleotide triphosphates were tested in buffers 1 through 6 at two different temperatures (25 and 37°C). Buffers 1-6 tested at 25°C were designated conditions 1-6 and buffers 1-6 tested at 37°C were designated conditions 7-12 (**Table 47**). In each condition, Y639F mutant T7 polymerase (Sousa and Padilla, *supra*) (0.3-2 mg/20 ml reaction), NTP's (2 mM each), DNA template (10 pmol), inorganic pyrophosphatase (5U/ml) and α-^{32}P NTP (0.8 mCi/pmol template) were combined and heated at the designated temperatures for 1-2 hours. The radiolabeled NTP used was different from the modified triphosphate being testing. The samples were resolved by polyacrylamide gel electrophoresis. Using a PhosphorImager (Molecular Dynamics, Sunnyvale, CA), the amount of full-length transcript was quantified and compared with an all-RNA control reaction. The data is presented in **Table 48**; results in each reaction are expressed as a percent compared to the all-ribonucleotide triphosphate (rNTP) control. The control was run with the mutant T7 polymerase using commercially available polymerase buffer (Boehringer Mannheim, Indianapolis, IN).

Incorporation of Modified NTP's using Wild-type T7 RNA polymerase

Bacteriophage T7 RNA polymerase was purchased from Boehringer Mannheim at 0.4 U/μL concentration. Applicant used the commercial buffer supplied with the enzyme and 0.2 μCi alpha-^{32}P NTP in a 50 μL reaction with nucleotides triphosphates at 2 mM each. The template was a double-stranded PCR fragment, which was used in previous screens. Reactions were carried out at 37°C for 1 hour. Ten μL of the sample was run on a 7.5% analytical PAGE and bands were quantitated using a PhosphorImager. Results are calculated as a comparison to an "all ribo" control (non-modified nucleotide triphosphates) and the results are in **Table 49.**

Incorporation of Multiple Modified nucleotide triphosphates Into Oligonucleotides

Combinations of modified nucleotide triphosphates were tested with the transcription protocol described above, to determine the rates of incorporation of two or more of these triphosphates. Incorporation of 2'-Deoxy-2'-(L-histidine) amino uridine (2'-his-NH_2-UTP) was tested with unmodified cytidine nucleotide triphosphates, rATP and rGTP in reaction condition number 9. The data is presented as a percentage of incorporation of modified NTP's compared to the all rNTP control and is shown in **Table 50a.**

Two modified cytidines (2'-NH_2-CTP or 2'dCTP) were incorporated along with 2'-his-NH_2-UTP with identical efficiencies. 2'-his-NH_2-UTP and 2'-NH_2-CTP were then tested with various unmodified and modified adenosine triphosphates in the same buffer **(Table 50b).** The best modified adenosine triphosphate for incorporation with both 2'-his-NH_2-UTP and 2'-NH_2-CTP was 2'-NH_2-DAPTP.

Optimization of Reaction conditions for Incorporation of Modified Nucleotide Triphosphate

The combination of 2'-his-NH_2-UTP, 2'-NH_2-CTP, 2'-NH_2-DAP, and rGTP was tested in several reaction conditions **(Table 51)** using the incorporation protocol described above. The results demonstrate that of the buffer conditions tested, incorporation of these modified nucleotide triphosphates occur in the presence of both methanol and LiCl.

Selection of Novel Enzymatic nucleic acid molecule Motifs using 2'-deoxy-2'amino Modified GTP and CTP

For selection of new enzymatic nucleic acid molecule motifs, pools of enzymatic nucleic acid molecules were designed to have two substrate binding arms (5 and 16 nucleotides long) and a random region in the middle. The substrate has a biotin on the 5' end, 5 nucleotides complementary to the short binding arm of the pool, an unpaired G (the desired cleavage site), and 16 nucleotides complementary to the long binding arm of the pool. The substrate was bound to column resin through an avidin-biotin complex. The general process for selection is shown in **Figure 11**. The protocols described below represent one possible method that may be utilized for selection of enzymatic nucleic acid molecules and are given as a non-limiting example of enzymatic nucleic acid molecule selection with combinatorial libraries.

Construction of Libraries:

The oligonucleotides listed below were synthesized by Operon Technologies (Alameda, CA). Templates were gel purified and then run through a Sep-Pak™ cartridge (Waters, Millford, MA) using the manufacturers protocol. Primers (MST3, MST7c, MST3del) were used without purification.

Primers:

MST3 (30 mer): 5'- CAC TTA GCA TTA ACC CTC ACT AAA GGC CGT-3'

MST7c (33 mer): 5'-TAA TAC GAC TCA CTA TAG GAA AGG TGT GCA ACC-3'

MST3del (18 mer): 5'-ACC CTC ACT AAA GGC CGT-3'

Templates:

MSN60c (93 mer): 5'-ACC CTC ACT AAA GGC CGT $(N)_{60}$ GGT TGC ACA CCT TTG-3'

MSN40c (73 mer): 5'-ACC CTC ACT AAA GGC CGT $(N)_{40}$ GGT TGC ACA CCT TTG-3'

MSN20c (53 mer): 5'-ACC CTC ACT AAA GGC CGT $(N)_{20}$ GGT TGC ACA CCT TTG-3'

N60 library was constructed using MSN60c as a template and MST3/MST7c as primers. N40 and N20 libraries were constructed using MSN40c (or MSN20c) as template and MST3del/MST7c as primers.

Single-stranded templates were converted into double-stranded DNA by the following protocol: 5 nmol template, 10 nmol each primer, in 10 ml reaction volume using standard PCR buffer, dNTP's, and taq DNA polymerase (all reagents from Boerhinger Mannheim). Synthesis cycle conditions were 94°C, 4 minutes; (94°C, 1 minute; 42°C, 1 minute; 72°C, 2 minutes) x 4; 72°C, 10 minutes. Products were checked on agarose gel to confirm the length of each fragment (N60=123 bp, N40=91 bp, N20=71 bp) and then were phenol/chloroform extracted and ethanol precipitated. The concentration of the double-stranded product was 25 μM.

Transcription of the initial pools was performed in a 1 ml volume comprising: 500 pmol double-stranded template (3 x 10^{14} molecules), 40 mM tris-HCl (pH 8.0), 12 mM $MgCl_2$, 1 mM spermidine, 5 mM DTT, 0.002% triton X-100, 1 mM LiCl, 4% PEG 8000, 10% methanol, 2 mM ATP (Pharmacia), 2 mM GTP (Pharmacia), 2 mM 2'-deoxy-2'-amino-CTP (USB), 2 mM 2'-deoxy-2'-amino-UTP (USB), 5 U/ml inorganic pyrophosphatase (Sigma), 5 U/μl T7 RNA polymerase (USB; Y639F mutant was used in some cases at 0.1 mg/ml (Sousa and Padilla, *supra*)), 37°C, 2 hours. Transcribed libraries were purified by denaturing PAGE (N60=106 ntds, N40=74, N20=54) and the resulting product was desalted using Sep-Pak™ columns and then ethanol precipitated.

Initial column-Selection:

The following biotinylated substrate was synthesized using standard protocols (Usman *et al.,* 1987 *J. Am. Chem. Soc.*, 109, 7845; Scaringe *et al.,* 1990 *Nucleic Acids Res*., 18, 5433; and Wincott *et al.,* 1995 *Nucleic Acids Res.* 23, 2677-2684):

5'-biotin-C18 spacer-GCC GUG GGU UGC ACA CCU UUC C-C18 spacer-thiol-modifier C6 S-S-inverted abasic-3'

Substrate was purified by denaturing PAGE and ethanol precipitated. 10 nmol of substrate was linked to a NeutrAvidin™ column using the following protocol: 400 μl UltraLink Immobilized NeutrAvidin™ slurry (200 μl beads, Pierce, Rockford, IL) were loaded into a polystyrene column (Pierce). The column was washed twice with 1 ml of binding buffer (20 mM $NaPO_4$ (pH 7.5), 150 mM NaCl) and then capped off (i.e., a cap was put on the bottom of the column to stop the flow). 200 μl of the substrate suspended in binding buffer was applied and allowed to incubate at room temperature for 30 minutes

with occasional vortexing to ensure even linking and distribution of the solution to the resin. After the incubation, the cap was removed and the column was washed with 1 ml binding buffer followed by 1 ml column buffer (50 mM tris-HCL (pH 8.5), 100 mM NaCl, 50 mM KCl). The column was then ready for use and capped off. 1 nmol of the initial pool RNA was loaded on the column in a volume of 200 µl column buffer. It was allowed to bind the substrate by incubating for 30 minutes at room temperature with occasional vortexing. After the incubation, the cap was removed and the column was washed twice with 1 ml column buffer and capped off. 200 µl of elution buffer (50 mM tris-HCl (pH 8.5), 100 mM NaCl, 50 mM KCl, 25 mM $MgCl_2$) was applied to the column followed by 30 minute incubation at room temperature with occasional vortexing. The cap was removed and four 200 µl fractions were collected using elution buffer.

Second column (counter selection):

A diagram for events in the second column is generally shown in **Figure 12** and substrate oligonucleotide used is shown below:

5'-GGU UGC ACA CCU UUC C-C18 spacer-biotin-inverted abasic-3'

This column substrate was linked to UltraLink NeutrAvidin™ resin as previously described (40 pmol) which was washed twice with elution buffer. The eluent from the first column purification was then run on the second column. The use of this column allowed for binding of RNA that non-specifically diluted from the first column, while RNA that performed a catalytic event and had product bound to it, flowed through the second column. The fractions were ethanol precipitated using glycogen as carrier and rehydrated in sterile water for amplification.

Amplification:

RNA and primer MST3 (10-100 pmol) were denatured at 90°C for 3 minutes in water and then snap-cooled on ice for one minute. The following reagents were added to the tube (final concentrations given): 1X PCR buffer (Boerhinger Mannheim), 1 mM dNTP's (for PCR, Boerhinger Mannheim), 2 U/µl RNase-Inhibitor (Boerhinger Mannheim), 10 U/µl Superscript™ II Reverse Transcriptase (BRL). The reaction was incubated for 1 hour at 42°C, then at 95°C for 5 minutes in order to destroy the

Superscript™. The following reagents were then added to the tube to increase the volume five-fold for the PCR step (final concentrations/amounts given): MST7c primer (10-100 pmol, same amount as in RT step), 1X PCR buffer, taq DNA polymerase (0.025-0.05 U/µl, Boerhinger Mannheim). The reaction was cycled as follows: 94°C, 4minutes; (94°C, 30s; 42-54°C, 30s; 72°C, 1minute) x 4-30 cycles; 72°C, 5minutes; 30°C, 30 minutes. Cycle number and annealing temperature were decided on a round by round basis. In cases where heteroduplex was observed, the reaction was diluted five-fold with fresh reagents and allowed to progress through 2 more amplification cycles. Resulting products were analyzed for size on an agarose gel (N60=123 bp, N40=103 bp, N20=83 bp) and then ethanol precipitated.

Transcriptions:

Transcription of amplified products was done using the conditions described above with the following modifications: 10-20% of the amplification reaction was used as template, reaction volume was 100-500 µl, and the products sizes varied slightly (N60=106 ntds, N40=86, N20=66). A small amount of ^{32}P-GTP was added to the reactions for quantitation purposes.

Subsequent rounds:

Subsequent rounds of selection used 20 pmols of input RNA and 40 pmol of the 22 nucleotide substrate on the column.

Activity of pools:

Pools were assayed for activity under single turnover conditions every three to four rounds. Activity assay conditions were as follows: 50 mM tris-HCl (pH 8.5), 25 mM $MgCl_2$, 100 mM NaCl, 50 mM KCl, trace ^{32}P-labeled substrate, 10 nM RNA pool. 2X pool in buffer and, separately, 2X substrate in buffer were incubated at 90°C for 3 minutes, then at 37°C for 3 minutes. Equal volume 2X substrate was then added the 2X pool tube (t=0). Initial assay time points were taken at 4 and 24 hours: 5 µl was removed and quenched in 8 µl cold Stop buffer (96% formamide, 20 mM EDTA, 0.05% bromphenyl blue/xylene cyanol). Samples were heated 90°C, 3 minutes, and loaded on a 20%

sequencing gel. Quantitation was performed using a Molecular Dynamics Phosphorimager and ImageQuaNT™ software. The data is shown in **Table 52.**

Samples from the pools of oligonucleotide were cloned into vectors and sequenced using standard protocols (Sambrook *et al., Molecular Cloning: A Laboratory Manual,* Cold Spring Harbor Laboratory Press). The enzymatic nucleic acid molecules were transcribed from a representative number of these clones using methods described in this application. Individuals from each pool were tested for RNA cleavage from N60 and N40 by incubating the enzymatic nucleic acid molecules from the clones with 5/16 substrate in 2mM MgCl2, pH 7.5, 10mM KCl at 37°C. The data in **Table 54** shows that the enzymatic nucleic acid molecules isolated from the pool are individually active.

<u>Kinetic Activity</u>:

Kinetic activity of the enzymatic nucleic acid molecule shown in **Table 54,** was determined by incubating enzymatic nucleic acid molecule (10 nM) with substrate in a cleavage buffer (pH 8.5, 25 mM $MgCl_2$, 100 mM NaCl, 50 mM KCl) at 37°C.

<u>Magnesium Dependence:</u>

Magnesium dependence of round 15 of N20 was tested by varying $MgCl_2$ while other conditions were held constant (50 mM tris [pH 8.0], 100 mM NaCl, 50 mM KCl, single turnover, 10 nM pool). The data is shown in **Table 55,** which demonstrates increased activity with increased magnesium concentrations.

<u>Selection of Novel Enzymatic nucleic acid molecule Motifs using 2'-Deoxy-2'-(*N*-histidyl) amino UTP, 2'-Fluoro-ATP, and 2'-deoxy-2'-amino CTP and GTP</u>

The method used for selection of novel enzymatic nucleic acid molecule motifs using 2'-deoxy-2'amino modified GTP and CTP was repeated using 2'-Deoxy-2'-(*N*-histidyl) amino UTP, 2'-Fluoro-ATP, and 2'-deoxy-2'-amino CTP and GTP. However, rather than causing cleavage on the initial column with $MgCl_2$, the initial random modified-RNA pool was loaded onto substrate-resin in the following buffer; 5 mM NaOAc pH 5.2, 1 M NaCl at 4° C. After ample washing, the resin was moved to 22 ° C and the buffer switch 20 mM HEPES pH 7.4, 140 mM KCl, 10 mM NaCl, 1 mM $CaCl_2$, 1 mM $MgCl_2$. In one selection of N60 oligonucleotides, no divalent cations ($MgCl_2$,

$CaCl_2$) was used. The resin was incubated for 10 minutes to allow reaction and the eluant collected.

The enzymatic nucleic acid molecule pools were capable of cleaving 1-3% of the present substrate even in the absence of divalent cations, the background (in the absence of modified pools) was 0.2 - 0.4 %.

<u>Synthesis of 5-substituted 2'-modified nucleosides</u>

When designing monomeric nucleoside triphosphates for selection of therapeutic catalytic RNAs, one has to take into account nuclease stability of such molecules in biological sera. A common approach to increase RNA stability is to replace the sugar 2'-OH group with other groups like 2'-fluoro, 2'-*O*-methyl or 2'-amino. Fortunately such 2'-modified pyrimidine 5'triphosphates are shown to be substrates for RNA polymerases. (Aurup, H.; Williams, D.M.; Eckstein, F. *Biochemistry* **1992**, *31*, 9637; and Padilla, R.; Sousa, R. *Nucleic Acids Res.* **1999**, *27*, 1561.) On the other hand it was shown that variety of substituents at pyrimidine 5-position is well tolerated by T7 RNA polymerase (Tarasow, T.M.; Eaton, B.E. *Biopolymers* **1998**, *48*, 29), most likely because the natural hydrogen-bonding pattern of these nucleotides is preserved. We have chosen 2'-fluoro and 2'-*O*-methyl pyrimidine nucleosides as starting materials for attachment of different functionalities to the 5-position of the base. Both rigid (alkynyl) and flexible (alkyl) spacers are used. The choice of imidazole, amino and carboxylate pendant groups is based on their ability to act as general acids, general bases, nucleophiles and metal ligands, all of which can improve the catalytic effectiveness of selected nucleic acids. **Figures 21 – 24** relate to the synthesis of these compounds.

2'-*O*-methyluridine was 3',5'-bis-acetylated using acetic anhydride in pyridine and then converted to its 5-iodo derivative **1a** using I_2/ceric ammonium nitrate reagent (Asakura, J.; Robins, M.J. *J. Org. Chem.* **1990**, *55*, 4928) (Scheme 1). Both reactions proceeded in a quantitative yield and no chromatographic purifications were needed. Coupling between **1** and *N*-trifluoroacetyl propargylamine using copper(I) iodide and tetrakis(triphenylphosphine)palladium(0) catalyst as described by Hobbs (Hobbs, F.W., Jr. *J. Org. Chem.* **1989**, *54*, 3420) yielded **2a** in 89% yield. Selective *O*-deacylation with aqueous NaOH afforded **3a** which was phosphorylated with $POCl_3$/triethylphosphate

(TEP) in the presence of 1,8-bis(dimethylamino)naphthalene (Proton-Sponge) (Method A) (Kovácz, T; Ötvös, L. Tetrahedron Lett. **1988**, *29*, 4525). The intermediate nucleoside phosphorodichloridate was condensed *in situ* with tri-*n*-butylammonium pyrophosphate. At the end, the *N*-TFA group was removed with concentrated ammonia. 5'- Triphosphate was purified on Sephadex® DEAE A-25 ion exchange column using a linear gradient of 0.1-0.8M triethylammonium bicarbonate (TEAB) for elution. Traces of contaminating inorganic pyrophosphate are removed using C-18 RP HPLC to afford analytically pure material. Conversion into Na-salt was achieved by passing the aqueous solution of triphosphate through Dowex 50WX8 ion exchange resin in Na^+ form to afford **4a** in 45% yield. When Proton-Sponge was omitted in the first phosphorylation step, yields were reduced to 10-20%. Catalytic hydrogenation of **3a** yielded 5-aminopropyl derivative **5a** which was phosphorylated under conditions identical to those described for propynyl derivative **3a** to afford triphosphate **6a** in 50% yield.

For the preparation of imidazole derivatized triphosphates **9a** and **11a**, we developed an efficient synthesis of *N*-diphenylcarbamoyl 4-imidazoleacetic acid ($ImAA^{DPC}$): Transient protection of carboxyl group as TMS-ester using TMS-Cl/pyridine followed by DPC-Cl allowed for a clean and quantitative conversion of 4-imidazoleacetic acid (ImAA) to its *N*-DPC protected derivative.

Complete deacylation of **2a** afforded 5-(3-aminopropynyl) derivative **8a** which was condensed with 4-imidazoleacetic acid in the presence of 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide (EDC) to afford **9a** in 68% yield. Catalytic hydrogenation of **8a** yielded 5-(3-aminopropyl) derivative **10a** which was condensed with $ImAA^{DPC}$ to yield conjugate **11a** in 32% yield. Yields in these couplings were greatly improved when 5'-OH was protected with DMT group (not shown) thus efficiently preventing undesired 5'-*O*-esterification. Both **9a** and **11a** failed to yield triphosphate products in reaction with $POCl_3$/TEP/Proton-Sponge.

On the contrary, phosphorylation of 3'-*O*-acetylated derivatives **12a** and **13a** using 2-chloro-4*H*-1,3,2-benzodioxaphosphorin-4-one followed by pyrophosphate addition and oxidation (Method B, Scheme 2; Ludwig, J., Eckstein, F., *J. Org. Chem*. 1989, 54, 631) afforded the desired triphosphates **14a** and **15a** in 57% yield, respectively.

2'-Deoxy-2'-fluoro nucleoside 5'-triphosphates containing amino- (**4b**, **6b**) and imidazole- (**14b**, **15b**) linked groups were synthesized in a manner analogous to that described for the preparation of 2'-*O*-methyl nucleoside 5'-triphosphates (Schemes 1 and 2). Again, only Ludwig-Eckstein's phosphorylation worked for the preparation of 4-imidazoleacetyl derivatized triphosphates.

It is worth noting that when "one-pot-two-steps" phosphorylation reaction (Kovácz, T; Ötvös, L. Tetrahedron Lett. **1988**, *29*, 4525) of **5b** was quenched with 40% aqueous methylamine instead of TEAB or H_2O, the γ-amidate **7b** was generated as the only detectable product. Similar reaction was reported recently for the preparation of the γ-amidate of pppA2'p5'A2'p5'A.[12]

Carboxylate group was introduced into 5-position of uridine both on the nucleoside level and post-synthetically (Method C) (Scheme 3). 5-Iodo-2'-deoxy-2'-fluorouridine (**16**) was coupled with methyl acrylate using modified Heck reaction[13] to yield **17** in 85% yield. 5'-*O*-Dimethoxytritylation, followed by *in situ* 3'-*O*-acetylation and subsequent detritylation afforded 3'-protected derivative **18**. Phosphorylation using 2-chloro-4*H*-1,3,2-benzodioxa-phosphorin-4-one followed by pyrophosphate addition and oxidation (Ludwig, J.; Eckstein, F. *J. Org. Chem.* **1989**, *54*, 631) afforded the desired triphosphate in 54% yield. On the other hand, 5-(3-aminopropyl)uridine 5'-triphosphate **6b** was coupled with *N*-hydroxysuccinimide ester of Fmoc-Asp-OFm to afford, after removal of Fmoc and Fm groups with diethylamine, the desired aminoacyl conjugate **20** in 50% yield.

Cytidine derivatives comprising 3-aminopropyl and 3(*N*-succinyl)aminopropyl groups were synthesized according to Scheme 4. Peracylated 5-(3-aminopropynyl)uracil derivative **2b** is reduced using catalytic hydrogenation and then converted in seven steps and 5% overall yield into 3'-acetylated cytidine derivative **25**. This synthesis was plagued by poor solubility of intermediates and formation of the N^4-cyclized byproduct during ammonia treatment of the 4-triazolyl intermediate. Phosphorylation of **25** as described in reference 11 yielded triphosphate **26** and N^4-cyclized product **27** in 1:1 ratio. They were easily separated on Sephadex DEAE A-25 ion exchange column using 0.1-0.8M TEAB gradient. It appears that under basic conditions the free primary amine can displace any remaining intact 4-NHBz group leading to the cyclized product. This is similar to displacement of 4-triazolyl group by primary amine as mentioned above.

We reasoned that utilization of N^4-unprotected cytidine will solve this problem. This lead to an improved synthesis of **26**: Iodination of 2'-deoxy-2'-fluorocytidine (**28**) provided the 5-iodo derivative **29** in 58% yield. This compound was then smoothly converted into 5-(3-aminopropynyl) derivative **30**. Hydrogenation afforded 5-(3-aminopropyl) derivative **31** which was phosphorylated directly with $POCl_3$/ PPi to afford **26** in 37% yield. Coupling of the 5'-triphosphate **26** with succinic anhydride yielded succinylated derivative **32** in 36% yield.

Synthesis of 5-Imidazoleacetic acid 2'-deoxy-5'-triphosphate uridine

5-dintrophenylimidazoleacetic acid 2'-deoxy uridine nucleoside (80 mg) was dissolved in 5 ml of triethylphosphate while stirring under argon, and the reaction mixture was cooled to 0°C. Phosphorous oxychloride (1.8 eq, 22 ml) was added to the reaction mixture at 0°C, three more aliquots were added over the course of 48 hours at room temperature. The reaction mixture was then diluted with anhydrous MeCN (5 ml) and cooled to 0°C, followed by the addition of tributylamine (0.65 ml) and tributylammonium pyrophosphate (4.0 eq, 0.24 g). After 45 minutes, the reaction was quenched with 10 ml aq. methyl amine for four hours. After co-evaporation with MeOH (3x), purified material on DEAE Sephadex followed by RP chromatography to afford 15 mg of triphosphate.

Synthesis of 2'-(*N*-lysyl)-amino-2'-deoxy-cytidine Triphosphate

2'-(N-lysyl)-amino-2'-deoxy cytidine (0.180 g, 0.22 mmol) was dissolved in triethyl phosphate (2.00 ml) under Ar. The solution was cooled to 0 °C in an ice bath. Phosphorus oxychloride (99.999%, 3 eq., 0.0672 mL) was added to the solution and the reaction was stirred for two hours at 0 °C. Tributylammonium pyrophosphate (4 eq., 0.400 g) was dissolved in 3.42 mL of acetonitrile and tribuytylamine (0.165 mL). Acetonitrile (1 mL) was added to the monophosphate solution followed by the pyrophosphate solution which was added dropwise. The resulting solution was clear. The reaction was allowed to warm up to room temperature. After stirring for 45 minutes, methylamine (5 mL) was added and the reaction and stirred at room temperature for 2 hours. A biphasic mixture appeared (little beads at the bottom of the flask). TLC (7:1:2 iPrOH:NH_4OH:H_2O) showed the appearance of triphosphate material. The solution was concentrated, dissolved in water and loaded on a newly prepared DEAE Sephadex A-25 column. The column was washed with a gradient up to 0.6 M TEAB buffer and the product eluted off in fractions

90-95. The fractions were analyzed by ion exchange HPLC. Each fraction showed one triphosphate peak that eluted at ~4.000 minutes. The fractions were combined and pumped down from methanol to remove buffer salt to yield 15.7 mg of product.

Synthesis of 2'-deoxy-2'-(L-histidine)amino Cytidine Triphosphate

2'-[*N*-Fmoc, N^{imid}-dinitrophenyl-histidyl]amino-2'-cytidine (0.310 g, 4.04 mmol) was dissolved in triethyl phosphate (3 ml) under Ar. The solution was cooled to 0 °C. Phosphorus oxychloride (1.8 eq., 0.068 mL) was added to the solution and stored overnight in the freezer. The next morning TLC (10% MeOH in CH_2Cl_2) showed significant starting material, one more equivalent of $POCl_3$ was added. After two hours, TLC still showed starting material. Tributylamine (0.303 mL) and Tributylammonium pyrophosphate (4 eq., 0.734 g) dissolved in 6.3 mL of acetonitrile (added dropwise) were added to the monophosphate solution. The reaction was allowed to warm up to room temperature. After stirring for 15 min, methylamine (10 mL) was added at room temperature and stirring continued for 2 hours. TLC (7:1:2 iPrOH:NH_4OH:H_2O) showed the appearance of triphosphate material. The solution was concentrated, dissolved in water and loaded on a DEAE Sephadex A-25 column. The column was washed with a gradient up to 0.6 M TEAB buffer and the product eluted off in fractions 170-179. The fractions were analyzed by ion exchange HPLC. Each fraction showed one triphosphate peak that eluted at ~6.77 minutes. The fractions were combined and pumped down from methanol to remove buffer salt to afford 17 mg of product.

Screening for Novel Enzymatic nucleic acid molecule Motifs Using Modified NTPs (Class I Motif)

Our initial pool contained 3 x 10^{14} individual sequences of 2'-amino-dCTP/2'-amino-dUTP RNA. We optimized transcription conditions in order to increase the amount of RNA product by inclusion of methanol and lithium chloride. 2'-amino-2'-deoxynucleotides do not interfere with the reverse transcription and amplification steps of selection and confer nuclease resistance. We designed the pool to have two binding arms complementary to the substrate, separated by the random 40 nucleotide region. The 16-mer substrate had two domains, 5 and 10 nucleotides long, that bind the pool, separated by an unpaired guanosine. On the 5' end of the substrate was a biotin attached by a C18 linker. This enabled us to link the substrate to a NeutrAvidin™ resin in a column format.

The desired reaction would be cleavage at the unpaired G upon addition of magnesium cofactor followed by dissociation from the column due to instability of the 5 base pair helix. A detailed protocol follows:

Enzymatic nucleic acid molecule Pool Prep: The initial pool DNA was prepared by converting the following template oligonucleotides into double-stranded DNA by filling in with taq polymerase. (template=5'-ACC CTC ACT AAA GGC CGT $(N)_{40}$ GGT TGC ACA CCT TTC-3'; primer 1=5'- CAC TTA GCA TTA ACC CTC ACT AAA GGC CGT-3'; primer 2=5'-TAA TAC GAC TCA CTA TAG GAA AGG TGT GCA ACC-3'.) All DNA oligonucleotides were synthesized by Operon technologies. Template oligos were purified by denaturing PAGE and Sep-pak chromatography columns (Waters). RNA substrate oligos were using standard solid phase chemistry and purified by denaturing PAGE followed by ethanol precipitation. Substrates for *in vitro* cleavage assays were 5'-end labeled with gamma-^{32}P-ATP and T4 polynucleotide kinase followed by denaturing PAGE purification and ethanol precipitation.

5 nmole of template, 10 nmole of each primer and 250 U taq polymerase were incubated in a 10 ml volume with 1X PCR buffer (10 mM tris-HCl (pH 8.3), 1.5 mM $MgCl_2$, 50 mM KCl) and 0.2 mM each dNTP as follows: 94°C, 4 minutes; (94°C, 1 min; 42°C, 1 min; 72°C, 2 min) through four cycles; and then 72°C, for 10 minutes. The product was analyzed on 2% Separide™ agarose gel for size and then was extracted twice with buffered phenol, then chloroform-isoamyl alcohol, and ethanol precipitated. The initial RNA pool was made by transcription of 500 pmole (3×10^{14} molecules) of this DNA as follows. Template DNA was added to 40 mM tris-HCl (pH 8.0), 12 mM $MgCl_2$, 5 mM dithiothreitol (DTT), 1 mM spermidine, 0.002% triton X-100, 1 mM LiCl, 4% PEG-8000, 10% methanol, 2 mM ATP, 2 mM GTP, 2 mM 2'-amino-dCTP, 2 mM 2'-amino-dUTP, 5 U/ml inorganic pyrophosphatase, and 5 U/µl T7 RNA polymerase at room temperature for a total volume of 1 ml. A separate reaction contained a trace amount of alpha-^{32}P-GTP for detection. Transcriptions were incubated at 37°C for 2 hours followed by addition of equal volume STOP buffer (94% formamide, 20 mM EDTA, 0.05% bromophenol blue). The resulting RNA was purified by 6% denaturing PAGE gel, Sep-pak™ chromatography, and ethanol precipitated.

INITIAL SELECTION: 2 nmole of 16 mer 5'-biotinylated substrate (5'-biotin-C18 linker-GCC GUG GGU UGC ACA C-3') was linked to 200 µl UltraLink Immobilized

NeutrAvidin™ resin (400 μl slurry, Pierce) in binding buffer (20 mM $NaPO_4$ (pH 7.5), 150 mM NaCl) for 30 minutes at room temperature. The resulting substrate column was washed with 2 ml binding buffer followed by 2 ml column buffer (50 mM tris-HCl (pH 8.5), 100 mM NaCl, 50 mM KCl). The flow was capped off and 1000 pmole of initial pool RNA in 200 μl column buffer was added to the column and incubated 30 minutes at room temperature. The column was uncapped and washed with 2 ml column buffer, then capped off. 200 μl elution buffer (=column buffer + 25 mM $MgCl_2$) was added to the column and allowed to incubate 30 minutes at room temperature. The column was uncapped and eluent collected followed by three 200 μl elution buffer washes. The eluent/washes were ethanol precipitated using glycogen as carrier and rehydrated in 50 μl sterile H_2O. The eluted RNA was amplified by standard reverse transcription/PCR amplification techniques. 5-31 μl RNA was incubated with 20 pmol of primer 1 in 14 μl volume 90° for 3 min then placed on ice for 1 minute. The following reagent were added (final concentrations noted): 1X PCR buffer, 1 mM each dNTP, 2 U/μl RNase Inhibitor, 10 U/μl SuperScript™ II reverse transcriptase. The reaction was incubated 42° for 1 hour followed by 95° for 5 min in order to inactivate the reverse transcriptase. The volume was then increased to 100 μl by adding water and reagents for PCR: 1X PCR buffer, 20 pmol primer 2, and 2.5 U taq DNA polymerase. The reaction was cycled in a Hybaid thermocycler: 94°, 4 min; (94°C, 30 sec; 54°C, 30 sec; 72°C, 1 min) X 25; 72°C, 5 min. Products were analyzed on agarose gel for size and ethanol precipitated. One-third to one-fifth of the PCR DNA was used to transcribe the next generation, in 100 μl volume, as described above. Subsequent rounds used 20 pmol RNA for the column with 40 pmol substrate.

TWO COLUMN SELECTION: At generation 8 (G8), the column selection was changed to the two column format. 200 pmoles of 22 mer 5'-biotinylated substrate (5'-biotin-C18 linker-GCC GUG GGU UGC ACA CCU UUC C-C18 linker-thiol modifier C6 S-S-inverted abasic-3') was used in the selection column as described above. Elution was in 200 μl elution buffer followed by a 1 ml elution buffer wash. The 1200 μl eluent was passed through a product trap column by gravity. The product trap column was prepared as follows: 200 pmol 16 mer 5'-biotinylated "product" (5'-GGU UGC ACA CCU UUC C-C18 linker-biotin-3') was linked to the column as described above and the column was equilibrated in elution buffer. Eluent from the product column was precipitated as

previously described. The products were amplified as above only with 2.5-fold more volume and 100 pmol each primer. 100 μl of the PCR reaction was used to do a cycle course; the remaining fraction was amplified the minimal number of cycles needed for product. After 3 rounds (G11), there was visible activity in a single turnover cleavage assay. By generation 13, 45% of the substrate was cleaved at 4 hours; k_{obs} of the pool was 0.037 min^{-1} in 25 mM $MgCl_2$. We subcloned and sequenced generation 13; the pool was still very diverse. Since our goal was a enzymatic nucleic acid molecule that would work in a physiological environment, we decided to change selection pressure rather than exhaustively catalog G13.

Reselection of the N40 pool was started from G12 DNA. Part of the G12 DNA was subjected to hypermutagenic PCR (Vartanian *et al.*, 1996, *Nucleic Acids Research* 24, 2627-2631) to introduce a 10% per position mutation frequency and was designated N40H. At round 19, part of the DNA was hypermutagenized again, giving N40M and N40HM (a total of 4 parallel pools). The column substrates remained the same; buffers were changed and temperature of binding and elution was raised to 37°C. Column buffer was replaced by physiological buffer (50 mM tris-HCl (pH 7.5), 140 mM KCl, 10 mM NaCl) and elution buffer was replaced by 1 mM Mg buffer (physiological buffer + 1 mM $MgCl_2$). Amount of time allowed for the pool to bind the column was eventually reduced to 10 min and elution time was gradually reduced from 30 min to 20 sec. Between rounds 18 and 23, k_{obs} for the N40 pool stayed relatively constant at 0.035-0.04 min^{-1}. Generation 22 from each of the 4 pools was cloned and sequenced.

CLONING AND SEQUENCING: Generations 13 and 22 were cloned using Novagen's Perfectly Blunt™ Cloning kit (pT7Blue-3 vector) following the kit protocol. Clones were screened for insert by PCR amplification using vector-specific primers. Positive clones were sequenced using ABI Prism 7700 sequence detection system and vector-specific primer. Sequences were aligned using MacVector software; two-dimensional folding was performed using Mulfold software (Zuker,, 1989, *Science* 244, 48-52; Jaeger *et al.*, 1989, *Biochemistry* 86, 7706-7710; Jaeger *et al.*, 1989, R. F. Doolittle ed., *Methods in Enzymology*, 183, 281-306). Individual clone transcription units were constructed by PCR amplification with 50 pmol each primer 1 and primer 2 in 1X PCR buffer, 0.2 mM each dNTP, and 2.5 U of taq polymerase in 100 μl volume cycled as follows: 94°C, 4 min; (94°C, 30 sec; 54°C, 30 sec; 72°C, 1 min) X 20; 72°C, 5 min.

Transcription units were ethanol precipitated, rehydrated in 30 μl H2O, and 10 μl was transcribed in 100 μl volume and purified as previously described.

Thirty-six clones from each pool were sequenced and were found to be variations of the same consensus motif. Unique clones were assayed for activity in 1 mM $MgCl_2$ and physiological conditions; nine clones represented the consensus sequence and were used in subsequent experiments. There were no mutations that significantly increased activity; most of the mutations were in regions believed to be duplex, based on the proposed secondary structure. In order to make the motif shorter, we deleted the 3'-terminal 25 nucleotides necessary to bind the primer for amplification. The measured rates of the full length and truncated molecules were both 0.04 min^{-1}; thus we were able reduce the size of the motif from 86 to 61 nucleotides. The molecule was shortened even further by truncating base pairs in the stem loop structures as well as the substrate recognition arms to yield a 48 nucleotide molecule. In addition, many of the ribonucleotides were replaced with 2-*O*-methyl modified nucleotides to stabilize the molecule. An example of the new motif is given in **Figure 13**. Those of ordinary skill in the art will recognize that the molecule is not limited to the chemical modifications shown in the figure and that it represents only one possible chemically modified molecule.

Kinetic Analysis:

Single turnover kinetics were performed with trace amounts of 5'-^{32}P-labeled substrate and 10-1000 nM pool of enzymatic nucleic acid molecule. 2X substrate in 1X buffer and 2X pool/enzymatic nucleic acid molecule in 1X buffer were incubated separately 90° for 3 min followed by equilibration to 37° for 3 min. Equal volume of 2X substrate was added to pool/enzymatic nucleic acid molecule at t_0 and the reaction was incubated at 37°C. Time points were quenched in 1.2 vol STOP buffer on ice. Samples were heated to 90°C for 3 min prior to separation on 15% sequencing gels. Gels were imaged using a PhosphorImager and quantitated using ImageQuant™ software (Molecular Dynamics). Curves were fit to double-exponential decay in most cases, although some of the curves required linear fits.

STABILITY: Serum stability assays were performed as previously described (Beigelman *et al.*, 1995, *J. Biol. Chem.* 270, 25702-25708). 1 μg of 5'-^{32}P-labeled

synthetic enzymatic nucleic acid molecule was added to 13 μl cold and assayed for decay in human serum. Gels and quantitation were as described in kinetics section.

SUBSTRATE REQUIREMENTS: **Table 60** outlines the substrate requirements for Class I motif. Substrates maintained Watson-Crick or wobble base pairing with mutant Class I constructs. Activity in single turnover kinetic assay is shown relative to wild type Class I and 22 mer substrate (50 mM Tris-HCL (pH 7.5), 140 mM KCl, 10 mM NaCl, 1 mM $MgCl_2$, 100 nM ribozyme, 5 nM substrate, 37°C).

RANDOM REGION MUTATION ALIGNMENT: **Table 61** outlines the random region alignment of 134 clones from generation 22 (1.x = N40, 2.x = N40M, 3.x = N40H, 4.x = N40HM). The number of copies of each mutant is in parenthesis in the table, deviations from consensus are shown. Mutations that maintain base pair U19:A34 are shown in italic. Activity in single turnover kinetic assay is shown relative to the G22 pool rate (50 mM Tris-HCL pH 7.5, 140 mM KCl, 10 mM NaCl, 1 mM $MgCl_2$, 100 nM ribozyme, trace substrate, 37°C).

STEM TRUNCATION AND LOOP REPLACEMENT ANALYSIS: **Figure 25** shows a representation of Class I ribozyme stem truncation and loop replacement analysis. The K_{rel} is compared to a 61 mer Class I ribozyme measured as described above. **Figure 26** shows examples of Class I ribozymes with truncated stem(s) and/or non-nucleotide linker replaced loop structures.

<u>Inhibition of HCV Using Class I (Amberzyme) Motif</u>

During HCV infection, viral RNA is present as a potential target for enzymatic nucleic acid molecule cleavage at several processes: uncoating, translation, RNA replication and packaging. Target RNA may be more or less accessible to enzymatic nucleic acid molecule cleavage at any one of these steps. Although the association between the HCV initial ribosome entry site (IRES) and the translation apparatus is mimicked in the HCV 5'UTR/luciferase reporter system, these other viral processes are not represented in the OST7 system. The resulting RNA/protein complexes associated with the target viral RNA are also absent. Moreover, these processes may be coupled in an HCV-infected cell which could further impact target RNA accessibility. Therefore, we

tested whether enzymatic nucleic acid molecules designed to cleave the HCV 5'UTR could effect a replicating viral system.

Recently, Lu and Wimmer characterized an HCV-poliovirus chimera in which the poliovirus IRES was replaced by the IRES from HCV (Lu & Wimmer, 1996, *Proc. Natl. Acad. Sci. USA*. 93, 1412-1417). Poliovirus (PV) is a positive strand RNA virus like HCV, but unlike HCV is non-enveloped and replicates efficiently in cell culture. The HCV-PV chimera expresses a stable, small plaque phenotype relative to wild type PV.

The capability of the new enzymatic nucleic acid molecule motifs to inhibit HCV RNA intracellularly was tested using a dual reporter system that utilizes both firefly and Renilla luciferase (**Figure 14**). A number of enzymatic nucleic acid molecules having the new class I motif (Amberzyme) were designed and tested (**Table 56**). The Amberzyme ribozymes were targeted to the 5' HCV UTR region, which when cleaved, would prevent the translation of the transcript into luciferase. OST-7 cells were plated at 12,500 cells per well in black walled 96-well plates (Packard) in medium DMEM containing 10% fetal bovine serum, 1% pen/strep, and 1% L-glutamine and incubated at 37°C overnight. A plasmid containing T7 promoter expressing 5' HCV UTR and firefly luciferase (T7C1-341 (Wang *et al.*, 1993, *J. of Virol.* 67, 3338-3344)) was mixed with a pRLSV40 Renilla control plasmid (Promega Corporation) followed by enzymatic nucleic acid molecule, and cationic lipid to make a 5X concentration of the reagents (T7C1-341 (4 μg/ml), pRLSV40 renilla luciferase control (6 μg/ml), enzymatic nucleic acid molecule (250 nM), transfection reagent (28.5 μg/ml).

The complex mixture was incubated at 37°C for 20 minutes. The media was removed from the cells and 120 μl of Opti-mem media was added to the well followed by 30 μl of the 5X complex mixture. 150 μl of Opti-mem was added to the wells holding the untreated cells. The complex mixture was incubated on OST-7 cells for 4 hours, lysed with passive lysis buffer (Promega Corporation) and luminescent signals were quantified using the Dual Luciferase Assay Kit using the manufacturer's protocol (Promega Corporation). The data shown in **Figure 15** is a dose curve of enzymatic nucleic acid molecule targeting site 146 of the HCV RNA and is presented as a ratio between the firefly and Renilla luciferase fluorescence. The enzymatic nucleic acid molecule was able to reduce the quantity of HCV RNA at all enzymatic nucleic acid molecule concentrations

yielding an IC_{50} of approximately 5 nM. Other sites were also efficacious (**Figure 16**), in particular enzymatic nucleic acid molecules targeting sites 133, 209, and 273 were also able to reduce HCV RNA compared to the irrelevant (IRR) controls.

Cleavage of Substrates Using Completely Modified class I (Amberzyme) enzymatic nucleic acid molecule

The ability of an enzymatic nucleic acid, which is modified at every 2' position to cleave a target RNA was tested to determine if any ribonucleotide positions are necessary in the Amberzyme motif. Enzymatic nucleic acid molecules were constructed with 2'-*O*-methyl, and 2'-amino (NH_2) nucleotides and included no ribonucleotides (**Table 56**; gene name: no ribo) and kinetic analysis was performed as described in example 13. 100 nM enzymatic nucleic acid was mixed with trace amounts of substrate in the presence of 1 mM $MgCl_2$ at physiological conditions (37°C). The Amberzyme with no ribonucleotide present in it has a K_{rel} of 0.13 compared to the enzymatic nucleic acid with a few ribonucleotides present in the molecule shown in **Table 56** (ribo). This shows that Amberzyme enzymatic nucleic acid molecule may not require the presence of 2'-OH groups within the molecule for activity.

Substrate Recognition Rules for Class II (zinzyme) enzymatic nucleic acid molecules

Class II (zinzyme) ribozymes were tested for their ability to cleave base-paired substrates with all sixteen possible combinations of bases immediately 5' and 3' proximal to the bulged cleavage site G. Ribozymes were identical in all remaining positions of their 7 base pair binding arms. Activity was assessed at two and twenty-four hour time points under standard reaction conditions [20 mM HEPES pH 7.4, 140 mM KCl, 10 mM NaCl, 1 mM $MgCl_2$, 1 mM $CaCl_2$ – 37^0 C]. **Figure 19** shows the results of this study. Base paired substrate UGG (not shown in the figure) cleaved as poorly as CGG shown in the figure. The figure shows the cleavage site substrate triplet in the 5'- 3' direction and 2 and 24 hour time points are shown top to bottom respectively. The results indicate the cleavage site triplet is most active with a 5'- Y-G-H –3' (where Y is C or U and H is A, C or U with cleavage between G and H); however, activity is detected particularly with the 24 hour time point for most paired substrates. All positions outside of the cleavage triplet were found to tolerate any base pairings (data not shown).

All possible mispairs immediately 5' and 3' proximal to the bulged cleavage site G were tested to a class II ribozyme designed to cleave a 5'-C-G-C –3'. It was observed the 5' and 3' proximal sites are as active with G:U wobble pairs, in addition, the 5' proximal site will tolerate a mismatch with only a slight reduction in activity [data not shown].

Screening for Novel Enzymatic nucleic acid molecule Motifs (Class II Motifs)

The selections were initiated with pools of > 10^{14} modified RNA's of the following sequence: 5'-GGGAGGAGGAAGUGCCU $(N)_{35}$ UGCCGCGCUCGCUCCCAGUCC-3'. The RNA was enzymatically generated using the mutant T7 Y639F RNA polymerase prepared by Rui Souza. The following modified NTP's were incorporated: 2'-deoxy-2'-fluoro-adenine triphosphate, 2'-deoxy-2'-fluoro-uridine triphosphate or 2'-deoxy-2'-fluoro-5-[(N-imidazole-4acetyl)propyl amine] uridine triphosphate, and 2'-deoxy-2'-amino-cytidine triphosphate; natural guanidine triphosphate was used in all selections so that alpha –^{32}P-GTP could be used to label pool RNA's. RNA pools were purified by denaturing gel electrophoresus 8% polyacrilamide 7 M Urea.

The following target RNA (resin A) was synthesized and coupled to Iodoacetyl Ultralink™ resin (Pierce) by the supplier's proceedure:5' –b-L-GGACUGGGAGCGAGCGCGGCGCAGGCACU GAAG-L-S-**B**-3'; where b is biotin (Glenn

Research cat# 10-1953-nn), L is polyethylene glycol spacer (Glenn Research cat# 10-1918-nn), S is thiol-modifier C6 S-S (Glenn Research cat# 10-1936-nn), **B** is a standard inverted deoxy abasic.

RNA pools were added to 100 µl of 5 uM Resin A in the buffer A (20 mM HEPES pH 7.4, 140 mM KCL, 10 mM NaCl) and incubated at 22^{0}C for 5 minutes. The temperature was then raised to 37^{0}C for 10 minutes. The resin was washed with 5 ml buffer A. Reaction was triggered by the addition of buffer B(20 mM HEPES pH 7.4, 140 mM KCL, 10 mM NaCl, 1 mM $MgCl_2$, 1 mM $CaCl_2$). Incubation proceeded for 20 minutes in the first generation and was reduced progressively to 1 minute in the final generations; with 13 total generations. The reaction eluent was collected in 5 M NaCl to give a final concentration of 2 M NaCl. To this was added 100 µl of 50% slurry Ultralink NeutraAvidin™ (Pierce). Binding of cleaved biotin product to the avidin resin was allowed by 20 minute incubation at 22^0 C. The resin was subsequently washed with 5 ml of 20 mM HEPES pH 7.4, 2 M NaCl. Desired RNA's were removed by a 1.2 ml denaturing wash 1M NaCl, 10 M Urea at 94^0 C over 10 minutes. RNA's were double precipitated in 0.3 M sodium acetate to remove Cl^- ions inhibitory to reverse transcription. Standard protocols of reverse transcription and PCR amplification were performed. RNA's were again transcribed with the modified NTP's described above. After 13 generations cloning and sequencing provided 14 sequences which were able to cleave the target substrate. Six sequences were characterized to determine secondary structure and kinetic cleavage rates. The structures and kinetic data are given in **Figure 17**. The sequences of eight other enzymatic nucleic acid molecule sequences are given in **Table 57**. The size, sequence, and chemical compositions of these molecules can be modified as described below or using other techniques well known in the art.

Nucleic Acid Catalyst Engineering

Sequence, chemical and structural variants of Class I and Class II enzymatic nucleic acid molecule can be engineered and re-engineered using the techniques shown in this application and known in the art. For example, the size of class I and class II enzymatic nucleic acid molecules can, be reduced or increased using the techniques known in the art (Zaug *et al.,* 1986, *Nature,* 324, 429; Ruffner *et al.,* 1990, *Biochem.*, 29, 10695; Beaudry *et*

al., 1990, *Biochem.*, 29, 6534; McCall *et al.*, 1992, *Proc. Natl. Acad. Sci., USA.*, 89, 5710; Long *et al.*, 1994, *supra*; Hendry *et al.*, 1994, *BBA* 1219, 405; Benseler *et al.*, 1993, *JACS*, 115, 8483; Thompson *et al.*, 1996, *Nucl. Acids Res.*, 24, 4401; Michels *et al.*, 1995, *Biochem.*, 34, 2965; Been *et al.*, 1992, *Biochem.*, 31, 11843; Guo *et al.*, 1995, *EMBO. J.*, 14, 368; Pan *et al.*, 1994, *Biochem.*, 33, 9561; Cech, 1992, *Curr. Op. Struc. Bio.*, 2, 605; Sugiyama *et al.*, 1996, *FEBS Lett.*, 392, 215; Beigelman *et al.*, 1994, *Bioorg. Med. Chem.*, 4, 1715; Santoro *et al.*, 1997, *PNAS* 94, 4262; all are incorporated in their totality by reference herein), to the extent that the overall catalytic activity of the ribozyme is not significantly decreased.

Further rounds of *in vitro* selection strategies described herein and variations thereof can be readily used by a person skilled in the art to evolve additional nucleic acid catalysts and such new catalysts are within the scope of the instant invention.

Example 16: Activity of Class II (zinzyme) nucleic acid catalysts to inhibit HER2 gene expression

Applicant has designed, synthesized and tested several class II (zinzyme) ribozymes targeted against HER2 RNA (see, for example, **Tables 58, 59, and 62)** in cell proliferation RNA reduction assays.

Proliferation assay:

The model proliferation assay used in the study can require a cell-plating density of 2000-10000 cells/well in 96-well plates and at least 2 cell doublings over a 5-day treatment period. Cells used in proliferation studies were either human breast or ovarian cancer cells (SKBR-3 and SKOV-3 cells respectively). To calculate cell density for proliferation assays, the FIPS (fluoro-imaging processing system) method well known in the art was used. This method allows for cell density measurements after nucleic acids are stained with CyQuant® dye, and has the advantage of accurately measuring cell densities over a very wide range 1,000-100,000 cells/well in 96-well format.

Ribozymes (50-200 nM) were delivered in the presence of cationic lipid at 2.0-5.0 µg/mL and inhibition of proliferation was determined on day 5 post-treatment. Two full ribozyme screens were completed resulting in the selection of 14 ribozymes. Class II (zinzyme) ribozymes against sites, 314 (RPI No. 18653), 443 (RPI No. 18680), 597 (RPI

No. 18697), 659 (RPI No. 18682), 878 (RPI Nos. 18683 and 18654), 881 (RPI Nos. 18684 and 18685) 934 (RPI No. 18651), 972 (RPI No. 18656, 19292, 19727, 19728, and 19293), 1292 (RPI No. 18726), 1541 (RPI No. 18687), 2116 (RPI No. 18729), 2932 (RPI No. 18678), 2540 (RPI No. 18715), and 3504 (RPI No. 18710) caused inhibition of proliferation ranging from 25-80% as compared to a scrambled control ribozyme. An example of results from a cell culture assay is shown in **Figure 20**. Referring to **Figure 20**, Class II ribozymes targeted against HER2 RNA are shown to cause significant inhibition of proliferation of cells. This shows that ribozymes, for instance the Class II (zinzyme) ribozymes are capable of inhibiting HER2 gene expression in mammalian cells.

RNA assay:

RNA was harvested 24 hours post-treatment using the Qiagen RNeasy® 96 procedure. Real time RT-PCR (TaqMan® assay) was performed on purified RNA samples using separate primer/probe sets specific for either target HER2 RNA or control actin RNA (to normalize for differences due to cell plating or sample recovery). Results are shown as the average of triplicate determinations of HER2 to actin RNA levels post-treatment. **Figure 30** shows class II ribozyme (zinzyme) mediated reduction in HER2 RNA targeting site 972 vs a scrambled attenuated control.

Dose response assays:

Active ribozyme was mixed with binding arm-attenuated control (BAC) ribozyme to a final oligonucleotide concentration of either 100, 200 or 400 nM and delivered to cells in the presence of cationic lipid at 5.0 µg/mL. Mixing active and BAC in this manner maintains the lipid to ribozyme charge ratio throughout the dose response curve. HER2 RNA reduction was measured 24 hours post-treatment and inhibition of proliferation was determined on day 5 post-treatment. The dose response antiproliferation results are summarized in **Figure 31** and the dose-dependent reduction of HER2 RNA results are summarized in **Figure 32**. **Figure 33** shows a combined dose response plot of both anti-proliferation and RNA reduction data for a class II ribozyme targeting site 972 of HER2 RNA (RPI 19293).

Example 17: Reduction of ribose residues in Class II (zinzyme) nucleic acid catalysts

Class II (zinzyme) nucleic acid catalysts were tested for their activity as a function ribonucleotide content. A Zinzyme having no ribonucleotide residue (*ie.,* no 2'-OH group at the 2' position of the nucleotide sugar) against the K-Ras site 521 was designed. This molecules were tested utilizing the chemistry shown in **Figure 27a**. The *in vitro* catalytic activity zinzyme construct was not significantly effected (the cleavage rate reduced only 10 fold).

The Kras zinzyme shown in **Figure 27a** was tested in physiological buffer with the divalent concentrations as indicated in the legend (high NaCl is an altered monovalent condition shown) of **Figure 28**. The 1 mM Ca^{++} condition yielded a rate of 0.005 min^{-1} while the 1 mM Mg^{++} condition yielded a rate of 0.002 min^{-1}. The ribose containing wild type yields a rate of 0.05 min^{-1} while substrate in the absence of zinzyme demonstrates less than 2% degradation at the longest time point under reaction conditions shown. This illustrates a well-behaved cleavage reaction done by a non-ribose containing catalyst with only a 10-fold reduced cleavage as compared to ribonucleotide-containing zinzyme and vastly above non-catalyzed degradation.

A more detailed investigation into the role of ribose positions in the Class II (zinzyme) motif was carried out in the context of the HER2 site 972 (Applicant has further designed a fully modified Zinzyme as shown in **Figure 27b** targeting the HER2 RNA site 972). **Figure 29** is a diagram of the alternate formats tested and their relative rates of catalysis. The effect of substitution of ribose G for the 2'-*O*-methyl C-2'-*O*-methyl A in the loop of Zinzyme (see **Figure 34**) was insignificant when assayed with the Kras target but showed a modest rate enhancement in the HER2 assays. The activity of all Zinzyme motifs, including the fully stabilized "0 ribose" (RPI 19727) are well above background noise level degradation. Zinzyme with only two ribose positions (RPI 19293) are sufficient to restore "wild-type" activity. Motifs containing 3 (RPI 19729), 4 (RPI 19730) or 5 ribose (RPI 19731) positions demonstrated a greater extent of cleavage and profiles almost identical to the 2 ribose motif. Applicant has thus demonstrated that a Zinzyme with no ribonucleotides present at any position can catalyze efficient RNA cleavage activity. Thus, Zinzyme enzymatic nucleic acid molecules do not require the presence of 2'-OH group within the molecule for catalytic activity.

Example 18: Activity of reduced ribose containing Class II (zinzyme) nucleic acid catalysts to inhibit HER2 gene expression

A cell proliferation assay for testing reduced ribo class II (zinzyme) nucleic acid catalysts (50-400 nM) targeting HER2 site 972 was performed as described in example 19. The results of this study are summarized in **Figure 35.** These results indicate significant inhibition of HER2 gene expression using stabilized Class II (zinzyme) motifs, including two ribo (RPI 19293), one ribo (RPI 19728), and non-ribo (RPI 19727) containing nucleic acid catalysts.

Applications

The use of NTP's described in this invention have several research and commercial applications. These modified nucleotide triphosphates can be used for *in vitro* selection (evolution) of oligonucleotides with novel functions. Examples of *in vitro* selection protocols are incorporated herein by reference (Joyce, 1989, *Gene,* 82, 83-87; Beaudry *et al.,* 1992, *Science* 257, 635-641; Joyce, 1992, *Scientific American* 267, 90-97; Breaker *et al.,* 1994, *TIBTECH* 12, 268; Bartel *et al.,*1993, *Science* 261:1411-1418; Szostak, 1993, *TIBS* 17, 89-93; Kumar *et al.,* 1995, *FASEB J.,* 9, 1183; Breaker, 1996, *Curr. Op. Biotech.,* 7, 442).

Additionally, these modified nucleotide triphosphates can be employed to generate modified oligonucleotide combinatorial chemistry libraries. Several references for this technology exist (Brenner *et al.,* 1992, *PNAS* 89, 5381-5383, Eaton, 1997, *Curr. Opin. Chem. Biol.* 1, 10-16), which are all incorporated herein by reference.

Diagnostic uses

Enzymatic nucleic acid molecules of this invention may be used as diagnostic tools to examine genetic drift and mutations within diseased cells or to detect the presence of specific RNA in a cell. The close relationship between enzymatic nucleic acid molecule activity and the structure of the target RNA allows the detection of mutations in any region of the molecule which alters the base-pairing and three-dimensional structure of the target RNA. By using multiple enzymatic nucleic acid molecules described in this invention, one may map nucleotide changes which are important to RNA structure and function *in vitro*, as well as in cells and tissues. Cleavage of target RNAs with enzymatic nucleic acid

molecules may be used to inhibit gene expression and define the role (essentially) of specified gene products in the progression of disease. In this manner, other genetic targets may be defined as important mediators of the disease. These experiments will lead to better treatment of the disease progression by affording the possibility of combinational therapies (*e.g.*, multiple enzymatic nucleic acid molecules targeted to different genes, enzymatic nucleic acid molecules coupled with known small molecule inhibitors, radiation or intermittent treatment with combinations of enzymatic nucleic acid molecules and/or other chemical or biological molecules). Other *in vitro* uses of enzymatic nucleic acid molecules of this invention are well known in the art, and include detection of the presence of mRNAs associated with related conditions. Such RNA is detected by determining the presence of a cleavage product after treatment with a enzymatic nucleic acid molecule using standard methodology.

In a specific example, enzymatic nucleic acid molecules which can cleave only wild-type or mutant forms of the target RNA are used for the assay. The first enzymatic nucleic acid molecule is used to identify wild-type RNA present in the sample and the second enzymatic nucleic acid molecule will be used to identify mutant RNA in the sample. As reaction controls, synthetic substrates of both wild-type and mutant RNA will be cleaved by both enzymatic nucleic acid molecules to demonstrate the relative enzymatic nucleic acid molecule efficiencies in the reactions and the absence of cleavage of the "non-targeted" RNA species. The cleavage products from the synthetic substrates will also serve to generate size markers for the analysis of wild type and mutant RNAs in the sample population. Thus each analysis can involve two enzymatic nucleic acid molecules, two substrates and one unknown sample which can be combined into six reactions. The presence of cleavage products can be determined using an RNAse protection assay so that full-length and cleavage fragments of each RNA can be analyzed in one lane of a polyacrylamide gel. It is not absolutely required to quantify the results to gain insight into the expression of mutant RNAs and putative risk of the desired phenotypic changes in target cells. The expression of mRNA whose protein product is implicated in the development of the phenotype is adequate to establish risk. If probes of comparable specific activity are used for both transcripts, then a qualitative comparison of RNA levels will be adequate and will decrease the cost of the initial diagnosis. Higher mutant form to

wild-type ratios will be correlated with higher risk whether RNA levels are compared qualitatively or quantitatively.

Additional Uses

Potential usefulness of sequence-specific enzymatic nucleic acid molecules of the instant invention can have many of the same applications for the study of RNA that DNA restriction endonucleases have for the study of DNA (Nathans *et al.*, 1975 *Ann. Rev. Biochem.* 44:273). For example, the pattern of restriction fragments can be used to establish sequence relationships between two related RNAs, and large RNAs could be specifically cleaved to fragments of a size more useful for study. The ability to engineer sequence specificity of the enzymatic nucleic acid molecule is ideal for cleavage of RNAs of unknown sequence. Applicant describes the use of nucleic acid molecules to down-regulate gene expression of target genes in bacterial, microbial, fungal, viral, and eukaryotic systems including plant, or mammalian cells.

All patents and publications mentioned in the specification are indicative of the levels of skill of those skilled in the art to which the invention pertains. All references cited in this disclosure are incorporated by reference to the same extent as if each reference had been incorporated by reference in its entirety individually.

One skilled in the art would readily appreciate that the present invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The methods and compositions described herein as presently representative of preferred embodiments are exemplary and are not intended as limitations on the scope of the invention. Changes therein and other uses will occur to those skilled in the art, which are encompassed within the spirit of the invention, are defined by the scope of the claims.

It will be readily apparent to one skilled in the art that varying substitutions and modifications may be made to the invention disclosed herein without departing from the scope and spirit of the invention. Thus, such additional embodiments are within the scope of the present invention and the following claims.

The invention illustratively described herein suitably may be practiced in the absence of any element or elements, limitation or limitations which is not specifically disclosed herein. Thus, for example, in each instance herein any of the terms "comprising",

"consisting essentially of" and "consisting of" may be replaced with either of the other two terms. The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention that in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed. Thus, it should be understood that although the present invention has been specifically disclosed by preferred embodiments, optional features, modification and variation of the concepts herein disclosed may be resorted to by those skilled in the art, and that such modifications and variations are considered to be within the scope of this invention as defined by the description and the appended claims.

In addition, where features or aspects of the invention are described in terms of Markush groups or other grouping of alternatives, those skilled in the art will recognize that the invention is also thereby described in terms of any individual member or subgroup of members of the Markush group or other group.

Thus, additional embodiments are within the scope of the invention and within the following claims

Table 1

TABLE 1

Characteristics of naturally occurring ribozymes

Group I Introns

- Size: ~150 to >1000 nucleotides.
- Requires a U in the target sequence immediately 5' of the cleavage site.
- Binds 4-6 nucleotides at the 5'-side of the cleavage site.
- Reaction mechanism: attack by the 3'-OH of guanosine to generate cleavage products with 3'-OH and 5'-guanosine.
- Additional protein cofactors required in some cases to help folding and maintainance of the active structure.
- Over 300 known members of this class. Found as an intervening sequence in *Tetrahymena thermophila* rRNA, fungal mitochondria, chloroplasts, phage T4, blue-green algae, and others.
- Major structural features largely established through phylogenetic comparisons, mutagenesis, and biochemical studies [i,ii].
- Complete kinetic framework established for one ribozyme [iii,iv,v,vi].
- Studies of ribozyme folding and substrate docking underway [vii,viii,ix].
- Chemical modification investigation of important residues well established [x,xi].
- The small (4-6 nt) binding site may make this ribozyme too non-specific for targeted RNA cleavage, however, the Tetrahymena group I intron has been used to repair a "defective" β-galactosidase message by the ligation of new β-galactosidase sequences onto the defective message [xii].

RNAse P RNA (M1 RNA)

- Size: ~290 to 400 nucleotides.
- RNA portion of a ubiquitous ribonucleoprotein enzyme.
- Cleaves tRNA precursors to form mature tRNA [xiii].
- Reaction mechanism: possible attack by M^{2+}-OH to generate cleavage products with 3'-OH and 5'-phosphate.
- RNAse P is found throughout the prokaryotes and eukaryotes. The RNA subunit has been sequenced from bacteria, yeast, rodents, and primates.
- Recruitment of endogenous RNAse P for therapeutic applications is possible through hybridization of an External Guide Sequence (EGS) to the target RNA [xiv,xv]
- Important phosphate and 2' OH contacts recently identified [xvi,xvii]

Group II Introns

- Size: >1000 nucleotides.
- Trans cleavage of target RNAs recently demonstrated [xviii,xix].

Table 1

- Sequence requirements not fully determined.
- Reaction mechanism: 2'-OH of an internal adenosine generates cleavage products with 3'-OH and a "lariat" RNA containing a 3'-5' and a 2'-5' branch point.
- Only natural ribozyme with demonstrated participation in DNA cleavage [xx,xxi] in addition to RNA cleavage and ligation.
- Major structural features largely established through phylogenetic comparisons [xxii].
- Important 2' OH contacts beginning to be identified [xxiii]
- Kinetic framework under development [xxiv]

Neurospora VS RNA

- Size: ~144 nucleotides.
- Trans cleavage of hairpin target RNAs recently demonstrated [xxv].
- Sequence requirements not fully determined.
- Reaction mechanism: attack by 2'-OH 5' to the scissile bond to generate cleavage products with 2',3'-cyclic phosphate and 5'-OH ends.
- Binding sites and structural requirements not fully determined.
- Only 1 known member of this class. Found in Neurospora VS RNA.

Hammerhead Ribozyme

(see text for references)

- Size: ~13 to 40 nucleotides.
- Requires the target sequence UH immediately 5' of the cleavage site.
- Binds a variable number nucleotides on both sides of the cleavage site.
- Reaction mechanism: attack by 2'-OH 5' to the scissile bond to generate cleavage products with 2',3'-cyclic phosphate and 5'-OH ends.
- 14 known members of this class. Found in a number of plant pathogens (virusoids) that use RNA as the infectious agent.
- Essential structural features largely defined, including 2 crystal structures [xxvi,xxvii]
- Minimal ligation activity demonstrated (for engineering through *in vitro* selection) [xxviii]
- Complete kinetic framework established for two or more ribozymes [xxix].
- Chemical modification investigation of important residues well established [xxx].

Hairpin Ribozyme

- Size: ~50 nucleotides.
- Requires the target sequence GUC immediately 3' of the cleavage site.
- Binds 4-6 nucleotides at the 5'-side of the cleavage site and a variable number to the 3'-side of the cleavage site.
- Reaction mechanism: attack by 2'-OH 5' to the scissile bond to generate cleavage products with 2',3'-cyclic phosphate and 5'-OH ends.
- 3 known members of this class. Found in three plant pathogen (satellite RNAs of the tobacco ringspot virus, arabis mosaic virus and chicory yellow mottle virus) which uses RNA as the infectious agent.
- Essential structural features largely defined [xxxi,xxxii,xxxiii,xxxiv]

Table 1

- Ligation activity (in addition to cleavage activity) makes ribozyme amenable to engineering through *in vitro* selection [xxxv]
- Complete kinetic framework established for one ribozyme [xxxvi].
- Chemical modification investigation of important residues begun [xxxvii,xxxviii].

Hepatitis Delta Virus (HDV) Ribozyme

- Size: ~60 nucleotides.
- Trans cleavage of target RNAs demonstrated [xxxix].
- Binding sites and structural requirements not fully determined, although no sequences 5' of cleavage site are required. Folded ribozyme contains a pseudoknot structure [xl].
- Reaction mechanism: attack by 2'-OH 5' to the scissile bond to generate cleavage products with 2',3'-cyclic phosphate and 5'-OH ends.
- Only 2 known members of this class. Found in human HDV.
- Circular form of HDV is active and shows increased nuclease stability [xli]

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Table 2

Table 2:

A. 2.5 μmol Synthesis Cycle ABI 394 Instrument

Reagent	Equivalents	Amount	Wait Time* DNA	Wait Time* 2'-O-methyl	Wait Time* RNA
Phosphoramidites	6.5	163 μL	45 sec	2.5 min	7.5 min
S-Ethyl Tetrazole	23.8	238 μL	45 sec	2.5 min	7.5 min
Acetic Anhydride	100	233 μL	5 sec	5 sec	5 sec
N-Methyl Imidazole	186	233 μL	5 sec	5 sec	5 sec
TCA	176	2.3 mL	21 sec	21 sec	21 sec
Iodine	11.2	1.7 mL	45 sec	45 sec	45 sec
Beaucage	12.9	645 μL	100 sec	300 sec	300 sec
Acetonitrile	NA	6.67 mL	NA	NA	NA

B. 0.2 μmol Synthesis Cycle ABI 394 Instrument

Reagent	Equivalents	Amount	Wait Time* DNA	Wait Time* 2'-O-methyl	Wait Time* RNA
Phosphoramidites	15	31 μL	45 sec	233 sec	465 sec
S-Ethyl Tetrazole	38.7	31 μL	45 sec	233 min	465 sec
Acetic Anhydride	655	124 μL	5 sec	5 sec	5 sec
N-Methyl Imidazole	1245	124 μL	5 sec	5 sec	5 sec
TCA	700	732 μL	10 sec	10 sec	10 sec
Iodine	20.6	244 μL	15 sec	15 sec	15 sec
Beaucage	7.7	232 μL	100 sec	300 sec	300 sec

Table 2

Acetonitrile	NA	2.64 mL	NA	NA	NA

C. 0.2 µmol Synthesis Cycle 96 well Instrument

Reagent	Equivalents DNA/2'-O-methyl/Ribo	Amount DNA/2'-O-methyl/Ribo	Wait Time* DNA	Wait Time* 2'-O-methyl	Wait Time* Ribo
Phosphoramidites	22/33/66	40/60/120 µL	60 sec	180 sec	360sec
S-Ethyl Tetrazole	70/105/210	40/60/120 µL	60 sec	180 min	360 sec
Acetic Anhydride	265/265/265	50/50/50 µL	10 sec	10 sec	10 sec
N-Methyl Imidazole	502/502/502	50/50/50 µL	10 sec	10 sec	10 sec
TCA	238/475/475	250/500/500 µL	15 sec	15 sec	15 sec
Iodine	6.8/6.8/6.8	80/80/80 µL	30 sec	30 sec	30 sec
Beaucage	34/51/51	80/120/120	100 sec	200 sec	200 sec
Acetonitrile	NA	1150/1150/1150 µL	NA	NA	NA

*** Wait time does not include contact time during delivery.**

Table 3

Table 3: Human PTP-1B Hammerhead Ribozyme and Target Sequence

Nt. Position	Ribozyme Sequence	Seq. ID Nos.	Substrate Sequence	Seq. ID Nos.
15	UGCCGCUC CUGAUGAG X CGAA AGGCCGCG	1	CGCGGCCT A GAGCGGCA	529
72	AUCUCCAU CUGAUGAG X CGAA ACGGGCCA	2	TGGCCCGT C ATGGAGAT	530
92	UCUGCUCG CUGAUGAG X CGAA ACUCCUUU	3	AAAGGAGT T CGAGCAGA	531
93	AUCUGCUC CUGAUGAG X CGAA AACUCCUU	4	AAGGAGTT C GAGCAGAT	532
102	GACUUGUC CUGAUGAG X CGAA AUCUGCUC	5	GAGCAGAT C GACAAGTC	533
110	AGCUCCCG CUGAUGAG X CGAA ACUUGUCG	6	CGACAAGT C CGGGAGCT	534
129	UCCUGGUA CUGAUGAG X CGAA AUGGCCGC	7	GCGGCCAT T TACCAGGA	535
130	AUCCUGGU CUGAUGAG X CGAA AAUGGCCG	8	CGGCCATT T ACCAGGAT	536
131	UAUCCUGG CUGAUGAG X CGAA AAAUGGCC	9	GGCCATTT A CCAGGATA	537
139	AUGUCGGA CUGAUGAG X CGAA AUCCUGGU	10	ACCAGGAT A TCCGACAT	538
141	UCAUGUCG CUGAUGAG X CGAA AUAUCCUG	11	CAGGATAT C CGACATGA	539
161	UACAUGGG CUGAUGAG X CGAA AGUCACUG	12	CAGTGACT T CCCATGTA	540
162	CUACAUGG CUGAUGAG X CGAA AAGUCACU	13	AGTGACTT C CCATGTAG	541
169	GGCCACUC CUGAUGAG X CGAA ACAUGGGA	14	TCCCATGT A GAGTGGCC	542
183	UUCUUAGG CUGAUGAG X CGAA AGCUUGGC	15	GCCAAGCT T CCTAAGAA	543
184	GUUCUUAG CUGAUGAG X CGAA AAGCUUGG	16	CCAAGCTT C CTAAGAAC	544
187	UUUGUUCU CUGAUGAG X CGAA AGGAAGCU	17	AGCTTCCT A AGAACAAA	545
205	UCUGUACC CUGAUGAG X CGAA AUUUCGGU	18	ACCGAAAT A GGTACAGA	546
209	CGUCUCUG CUGAUGAG X CGAA ACCUAUUU	19	AAATAGGT A CAGAGACG	547
219	AAGGGACU CUGAUGAG X CGAA ACGUCUCU	20	AGAGACGT C AGTCCCTT	548
223	GUCAAAGG CUGAUGAG X CGAA ACUGACGU	21	ACGTCAGT C CCTTTGAC	549
227	UAUGGUCA CUGAUGAG X CGAA AGGGACUG	22	CAGTCCCT T TGACCATA	550
228	CUAUGGUC CUGAUGAG X CGAA AAGGGACU	23	AGTCCCTT T GACCATAG	551
235	AAUCCGAC CUGAUGAG X CGAA AUGGUCAA	24	TTGACCAT A GTCGGATT	552
238	UUUAAUCC CUGAUGAG X CGAA ACUAUGGU	25	ACCATAGT C GGATTAAA	553
243	UGUAGUUU CUGAUGAG X CGAA AUCCGACU	26	AGTCGGAT T AAACTACA	554
244	AUGUAGUU CUGAUGAG X CGAA AAUCCGAC	27	GTCGGATT A AACTACAT	555
249	UCUUGAUG CUGAUGAG X CGAA AGUUUAAU	28	ATTAAACT A CATCAAGA	556
253	AUCUUCUU CUGAUGAG X CGAA AUGUAGUU	29	AACTACAT C AAGAAGAT	557
262	AUAGUCAU CUGAUGAG X CGAA AUCUUCUU	30	AAGAAGAT A ATGACTAT	558
269	CGUUGAUA CUGAUGAG X CGAA AGUCAUUA	31	TAATGACT A TATCAACG	559
271	AGCGUUGA CUGAUGAG X CGAA AUAGUCAU	32	ATGACTAT A TCAACGCT	560
273	CUAGCGUU CUGAUGAG X CGAA AUAUAGUC	33	GACTATAT C AACGCTAG	561
280	UAUCAAAC CUGAUGAG X CGAA AGCGUUGA	34	TCAACGCT A GTTTGATA	562
283	UUUUAUCA CUGAUGAG X CGAA ACUAGCGU	35	ACGCTAGT T TGATAAAA	563
284	UUUUUAUC CUGAUGAG X CGAA AACUAGCG	36	CGCTAGTT T GATAAAAA	564
288	UCCAUUUU CUGAUGAG X CGAA AUCAAACU	37	AGTTTGAT A AAAATGGA	565
313	AAGAAUGU CUGAUGAG X CGAA ACUCCUUU	38	AAAGGAGT T ACATTCTT	566
314	UAAGAAUG CUGAUGAG X CGAA AACUCCUU	39	AAGGAGTT A CATTCTTA	567
318	UGGGUAAG CUGAUGAG X CGAA AUGUAACU	40	AGTTACAT T CTTACCCA	568
319	CUGGGUAA CUGAUGAG X CGAA AAUGUAAC	41	GTTACATT C TTACCCAG	569
321	CCCUGGGU CUGAUGAG X CGAA AGAAUGUA	42	TACATTCT T ACCCAGGG	570
322	GCCCUGGG CUGAUGAG X CGAA AAGAAUGU	43	ACATTCTT A CCCAGGGC	571
334	GUUAGGCA CUGAUGAG X CGAA AGGGCCCU	44	AGGGCCCT T TGCCTAAC	572

Table 3

335	UGUUAGGC CUGAUGAG X CGAA AAGGGCCC	45	GGGCCCTT T GCCTAACA	573
340	GCAUGUGU CUGAUGAG X CGAA AGGCAAAG	46	CTTTGCCT A ACACATGC	574
352	CCAAAAGU CUGAUGAG X CGAA ACCGCAUG	47	CATGCGGT C ACTTTTGG	575
356	UCUCCCAA CUGAUGAG X CGAA AGUGACCG	48	CGGTCACT T TTGGGAGA	576
357	AUCUCCCA CUGAUGAG X CGAA AAGUGACC	49	GGTCACTT T TGGGAGAT	577
358	CAUCUCCC CUGAUGAG X CGAA AAAGUGAC	50	GTCACTTT T GGGAGATG	578
393	AGCAUGAC CUGAUGAG X CGAA ACACCCCU	51	AGGGGTGT C GTCATGCT	579
396	UUGAGCAU CUGAUGAG X CGAA ACGACACC	52	GGTGTCGT C ATGCTCAA	580
402	ACUCUGUU CUGAUGAG X CGAA AGCAUGAC	53	GTCATGCT C AACAGAGT	581
424	UUUUAACG CUGAUGAG X CGAA ACCUUUCU	54	AGAAAGGT T CGTTAAAA	582
425	AUUUUAAC CUGAUGAG X CGAA AACCUUUC	55	GAAAGGTT C GTTAAAAT	583
428	CGCAUUUU CUGAUGAG X CGAA ACGAACCU	56	AGGTTCGT T AAAATGCG	584
429	GCGCAUUU CUGAUGAG X CGAA AACGAACC	57	GGTTCGTT A AAATGCGC	585
443	GUGGCCAG CUGAUGAG X CGAA AUUGUGCG	58	CGCACAAT A CTGGCCAC	586
474	UCUUCAAA CUGAUGAG X CGAA AUCAUCUC	59	GAGATGAT C TTTGAAGA	587
476	UGUCUUCA CUGAUGAG X CGAA AGAUCAUC	60	GATGATCT T TGAAGACA	588
477	GUGUCUUC CUGAUGAG X CGAA AAGAUCAU	61	ATGATCTT T GAAGACAC	589
490	UAAUUUCA CUGAUGAG X CGAA AUUUGUGU	62	ACACAAAT T TGAAATTA	590
491	UUAAUUUC CUGAUGAG X CGAA AAUUUGUG	63	CACAAATT T GAAATTAA	591
497	UCAAUGUU CUGAUGAG X CGAA AUUUCAAA	64	TTTGAAAT T AACATTGA	592
498	AUCAAUGU CUGAUGAG X CGAA AAUUUCAA	65	TTGAAATT A ACATTGAT	593
503	CAGAGAUC CUGAUGAG X CGAA AUGUUAAU	66	ATTAACAT T GATCTCTG	594
507	UCUUCAGA CUGAUGAG X CGAA AUCAAUGU	67	ACATTGAT C TCTGAAGA	595
509	UAUCUUCA CUGAUGAG X CGAA AGAUCAAU	68	ATTGATCT C TGAAGATA	596
517	UGACUUGA CUGAUGAG X CGAA AUCUUCAG	69	CTGAAGAT A TCAAGTCA	597
519	UAUGACUU CUGAUGAG X CGAA AUAUCUUC	70	GAAGATAT C AAGTCATA	598
524	UAUAAUAU CUGAUGAG X CGAA ACUUGAUA	71	TATCAAGT C ATATTATA	599
527	CUGUAUAA CUGAUGAG X CGAA AUGACUUG	72	CAAGTCAT A TTATACAG	600
529	CACUGUAU CUGAUGAG X CGAA AUAUGACU	73	AGTCATAT T ATACAGTG	601
530	GCACUGUA CUGAUGAG X CGAA AAUAUGAC	74	GTCATATT A TACAGTGC	602
532	UCGCACUG CUGAUGAG X CGAA AUAAUAUG	75	CATATTAT A CAGTGCGA	603
546	UCCAAUUC CUGAUGAG X CGAA AGCUGUCG	76	CGACAGCT A GAATTGGA	604
551	GGUUUUCC CUGAUGAG X CGAA AUUCUAGC	77	GCTAGAAT T GGAAAACC	605
561	UGGGUUGU CUGAUGAG X CGAA AGGUUUUC	78	GAAAACCT T ACAACCCA	606
562	UUGGGUUG CUGAUGAG X CGAA AAGGUUUU	79	AAAACCTT A CAACCCAA	607
577	GAUCUCUC CUGAUGAG X CGAA AGUUUCUU	80	AAGAAACT C GAGAGATC	608
585	AAAUGUAA CUGAUGAG X CGAA AUCUCUCG	81	CGAGAGAT C TTACATTT	609
587	GGAAAUGU CUGAUGAG X CGAA AGAUCUCU	82	AGAGATCT T ACATTTCC	610
588	UGGAAAUG CUGAUGAG X CGAA AAGAUCUC	83	GAGATCTT A CATTTCCA	611
592	AUAGUGGA CUGAUGAG X CGAA AUGUAAGA	84	TCTTACAT T TCCACTAT	612
593	UAUAGUGG CUGAUGAG X CGAA AAUGUAAG	85	CTTACATT T CCACTATA	613
594	GUAUAGUG CUGAUGAG X CGAA AAAUGUAA	86	TTACATTT C CACTATAC	614
599	AUGUGGUA CUGAUGAG X CGAA AGUGGAAA	87	TTTCCACT A TACCACAT	615
601	CCAUGUGG CUGAUGAG X CGAA AUAGUGGA	88	TCCACTAT A CCACATGG	616
617	GGACUCCA CUGAUGAG X CGAA AGUCAGGC	89	GCCTGACT T TGGAGTCC	617
618	GGGACUCC CUGAUGAG X CGAA AAGUCAGG	90	CCTGACTT T GGAGTCCC	618
624	GAUUCAGG CUGAUGAG X CGAA ACUCCAAA	91	TTTGGAGT C CCTGAATC	619

Table 3

632	AGGCUGGU CUGAUGAG X CGAA AUUCAGGG	92	CCCTGAAT C ACCAGCCT	620
641	UCAAGAAU CUGAUGAG X CGAA AGGCUGGU	93	ACCAGCCT C ATTCTTGA	621
644	AGUUCAAG CUGAUGAG X CGAA AUGAGGCU	94	AGCCTCAT T CTTGAACT	622
645	AAGUUCAA CUGAUGAG X CGAA AAUGAGGC	95	GCCTCATT C TTGAACTT	623
647	GAAAGUUC CUGAUGAG X CGAA AGAAUGAG	96	CTCATTCT T GAACTTTC	624
653	UGAAAAGA CUGAUGAG X CGAA AGUUCAAG	97	CTTGAACT T TCTTTTCA	625
654	UUGAAAAG CUGAUGAG X CGAA AAGUUCAA	98	TTGAACTT T CTTTTCAA	626
655	UUUGAAAA CUGAUGAG X CGAA AAAGUUCA	99	TGAACTTT C TTTTCAAA	627
657	ACUUUGAA CUGAUGAG X CGAA AGAAAGUU	100	AACTTTCT T TTCAAAGT	628
658	GACUUUGA CUGAUGAG X CGAA AAGAAAGU	101	ACTTTCTT T TCAAAGTC	629
659	GGACUUUG CUGAUGAG X CGAA AAAGAAAG	102	CTTTCTTT T CAAAGTCC	630
660	CGGACUUU CUGAUGAG X CGAA AAAAGAAA	103	TTTCTTTT C AAAGTCCG	631
666	GACUCUCG CUGAUGAG X CGAA ACUUUGAA	104	TTCAAAGT C CGAGAGTC	632
674	GUGACCCU CUGAUGAG X CGAA ACUCUCGG	105	CCGAGAGT C AGGGTCAC	633
680	GGCUGAGU CUGAUGAG X CGAA ACCCUGAC	106	GTCAGGGT C ACTCAGCC	634
684	UCCGGGCU CUGAUGAG X CGAA AGUGACCC	107	GGGTCACT C AGCCCGGA	635
705	UGCACCAC CUGAUGAG X CGAA ACGGGCCC	108	GGGCCCGT T GTGGTGCA	636
729	GACCUGCC CUGAUGAG X CGAA AUGCCUGC	109	GCAGGCAT C GGCAGGTC	637
737	AGGUUCCA CUGAUGAG X CGAA ACCUGCCG	110	CGGCAGGT C TGGAACCT	638
746	CCAGACAG CUGAUGAG X CGAA AGGUUCCA	111	TGGAACCT T CTGTCTGG	639
747	GCCAGACA CUGAUGAG X CGAA AAGGUUCC	112	GGAACCTT C TGTCTGGC	640
751	AUCAGCCA CUGAUGAG X CGAA ACAGAAGG	113	CCTTCTGT C TGGCTGAT	641
760	GAGGCAGG CUGAUGAG X CGAA AUCAGCCA	114	TGGCTGAT A CCTGCCTC	642
768	AUCAGCAA CUGAUGAG X CGAA AGGCAGGU	115	ACCTGCCT C TTGCTGAT	643
770	CCAUCAGC CUGAUGAG X CGAA AGAGGCAG	116	CTGCCTCT T GCTGATGG	644
796	AACGGAAG CUGAUGAG X CGAA AGGGUCUU	117	AAGACCCT T CTTCCGTT	645
797	CAACGGAA CUGAUGAG X CGAA AAGGGUCU	118	AGACCCTT C TTCCGTTG	646
799	AUCAACGG CUGAUGAG X CGAA AGAAGGGU	119	ACCCTTCT T CCGTTGAT	647
800	UAUCAACG CUGAUGAG X CGAA AAGAAGGG	120	CCCTTCTT C CGTTGATA	648
804	UUGAUAUC CUGAUGAG X CGAA ACGGAAGA	121	TCTTCCGT T GATATCAA	649
808	UUUCUUGA CUGAUGAG X CGAA AUCAACGG	122	CCGTTGAT A TCAAGAAA	650
810	ACUUUCUU CUGAUGAG X CGAA AUAUCAAC	123	GTTGATAT C AAGAAAGT	651
824	UCAUUUCU CUGAUGAG X CGAA ACAGCACU	124	AGTGCTGT T AGAAATGA	652
825	CUCAUUUC CUGAUGAG X CGAA AACAGCAC	125	GTGCTGTT A GAAATGAG	653
839	CCAUCCGA CUGAUGAG X CGAA ACUUCCUC	126	GAGGAAGT T TCGGATGG	654
840	CCCAUCCG CUGAUGAG X CGAA AACUUCCU	127	AGGAAGTT T CGGATGGG	655
841	CCCCAUCC CUGAUGAG X CGAA AAACUUCC	128	GGAAGTTT C GGATGGGG	656
855	GCUGUCUG CUGAUGAG X CGAA AUCAGCCC	129	GGGCTGAT C CAGACAGC	657
878	GGUAGGAG CUGAUGAG X CGAA AGCGCAGC	130	GCTGCGCT T CTCCTACC	658
879	AGGUAGGA CUGAUGAG X CGAA AAGCGCAG	131	CTGCGCTT C TCCTACCT	659
881	CCAGGUAG CUGAUGAG X CGAA AGAAGCGC	132	GCGCTTCT C CTACCTGG	660
884	CAGCCAGG CUGAUGAG X CGAA AGGAGAAG	133	CTTCTCCT A CCTGGCTG	661
897	GCACCUUC CUGAUGAG X CGAA AUCACAGC	134	GCTGTGAT C GAAGGTGC	662
911	CCAUGAUG CUGAUGAG X CGAA AUUUGGCA	135	TGCCAAAT T CATCATGG	663
912	CCCAUGAU CUGAUGAG X CGAA AAUUUGGC	136	GCCAAATT C ATCATGGG	664
915	UCCCCCAU CUGAUGAG X CGAA AUGAAUUU	137	AAATTCAT C ATGGGGGA	665
926	GCACGGAA CUGAUGAG X CGAA AGUCCCCC	138	GGGGGACT C TTCCGTGC	666

Table 3

928	CUGCACGG CUGAUGAG X CGAA AGAGUCCC	139	GGGACTCT T CCGTGCAG	667
929	CCUGCACG CUGAUGAG X CGAA AAGAGUCC	140	GGACTCTT C CGTGCAGG	668
940	CUUCCACU CUGAUGAG X CGAA AUCCUGCA	141	TGCAGGAT C AGTGGAAG	669
954	UCGUGGGA CUGAUGAG X CGAA AGCUCCUU	142	AAGGAGCT T TCCCACGA	670
955	CUCGUGGG CUGAUGAG X CGAA AAGCUCCU	143	AGGAGCTT T CCCACGAG	671
956	CCUCGUGG CUGAUGAG X CGAA AAAGCUCC	144	GGAGCTTT C CCACGAGG	672
988	UGGGGGGA CUGAUGAG X CGAA AUGCUCGG	145	CCGAGCAT A TCCCCCCA	673
990	GGUGGGGG CUGAUGAG X CGAA AUAUGCUC	146	GAGCATAT C CCCCCACC	674
1000	UGGCCGGG CUGAUGAG X CGAA AGGUGGGG	147	CCCCACCT C CCCGGCCA	675
1020	GGCUCCAG CUGAUGAG X CGAA AUUCGUUU	148	AAACGAAT C CTGGAGCC	676
1052	UUGGGAAG CUGAUGAG X CGAA ACUCCCUG	149	CAGGGAGT T CTTCCCAA	677
1053	UUUGGGAA CUGAUGAG X CGAA AACUCCCU	150	AGGGAGTT C TTCCCAAA	678
1055	GAUUUGGG CUGAUGAG X CGAA AGAACUCC	151	GGAGTTCT T CCCAAATC	679
1056	UGAUUUGG CUGAUGAG X CGAA AAGAACUC	152	GAGTTCTT C CCAAATCA	680
1063	CCACUGGU CUGAUGAG X CGAA AUUUGGGA	153	TCCCAAAT C ACCAGTGG	681
1096	GCAGUCUU CUGAUGAG X CGAA AUCCUCCU	154	AGGAGGAT A AAGACTGC	682
1110	UCUUCCUU CUGAUGAG X CGAA AUGGGGCA	155	TGCCCCAT C AAGGAAGA	683
1133	CGGCAUUU CUGAUGAG X CGAA AGGGGCUU	156	AAGCCCCT T AAATGCCG	684
1134	GCGGCAUU CUGAUGAG X CGAA AAGGGGCU	157	AGCCCCTT A AATGCCGC	685
1148	CGAUGCCG CUGAUGAG X CGAA AGGGUGCG	158	CGCACCCT A CGGCATCG	686
1155	AUGCUUUC CUGAUGAG X CGAA AUGCCGUA	159	TACGGCAT C GAAAGCAT	687
1168	AGUGUCUU CUGAUGAG X CGAA ACUCAUGC	160	GCATGAGT C AAGACACT	688
1182	CGACUUCU CUGAUGAG X CGAA ACUUCAGU	161	ACTGAAGT T AGAAGTCG	689
1183	CCGACUUC CUGAUGAG X CGAA AACUUCAG	162	CTGAAGTT A GAAGTCGG	690
1189	CACGACCC CUGAUGAG X CGAA ACUUCUAA	163	TTAGAAGT C GGGTCGTG	691
1194	CCCCCCAC CUGAUGAG X CGAA ACCCGACU	164	AGTCGGGT C GTGGGGGG	692
1207	ACCUCGAA CUGAUGAG X CGAA ACUUCCCC	165	GGGGAAGT C TTCGAGGT	693
1209	GCACCUCG CUGAUGAG X CGAA AGACUUCC	166	GGAAGTCT T CGAGGTGC	694
1210	GGCACCUC CUGAUGAG X CGAA AAGACUUC	167	GAAGTCTT C GAGGTGCC	695
1229	UGGCUGGG CUGAUGAG X CGAA AGGCAGCC	168	GGCTGCCT C CCCAGCCA	696
1250	CGGGCAGU CUGAUGAG X CGAA ACGGCUCC	169	GGAGCCGT C ACTGCCCG	697
1285	CUUCCAGU CUGAUGAG X CGAA ACUCAGUG	170	CACTGAGT T ACTGGAAG	698
1286	GCUUCCAG CUGAUGAG X CGAA AACUCAGU	171	ACTGAGTT A CTGGAAGC	699
1298	UGACCAGG CUGAUGAG X CGAA AGGGCUUC	172	GAAGCCCT T CCTGGTCA	700
1299	UUGACCAG CUGAUGAG X CGAA AAGGGCUU	173	AAGCCCTT C CTGGTCAA	701
1305	CACAUGUU CUGAUGAG X CGAA ACCAGGAA	174	TTCCTGGT C AACATGTG	702
1321	GAGGACCG CUGAUGAG X CGAA AGCCACGC	175	GCGTGGCT A CGGTCCTC	703
1326	GCCGUGAG CUGAUGAG X CGAA ACCGUAGC	176	GCTACGGT C CTCACGGC	704
1329	CCGGCCGU CUGAUGAG X CGAA AGGACCGU	177	ACGGTCCT C ACGGCCGG	705
1342	GCAGAGGU CUGAUGAG X CGAA AGCGCCGG	178	CCGGCGCT T ACCTCTGC	706
1343	AGCAGAGG CUGAUGAG X CGAA AAGCGCCG	179	CGGCGCTT A CCTCTGCT	707
1347	CUGUAGCA CUGAUGAG X CGAA AGGUAAGC	180	GCTTACCT C TGCTACAG	708
1352	GGAACCUG CUGAUGAG X CGAA AGCAGAGG	181	CCTCTGCT A CAGGTTCC	709
1358	UGAACAGG CUGAUGAG X CGAA ACCUGUAG	182	CTACAGGT T CCTGTTCA	710
1359	UUGAACAG CUGAUGAG X CGAA AACCUGUA	183	TACAGGTT C CTGTTCAA	711
1364	UGCUGUUG CUGAUGAG X CGAA ACAGGAAC	184	GTTCCTGT T CAACAGCA	712
1365	UUGCUGUU CUGAUGAG X CGAA AACAGGAA	185	TTCCTGTT C AACAGCAA	713

Table 3

1379	GGUCAGGC CUGAUGAG X CGAA AUGUGUUG	186	CAACACAT A GCCTGACC	714
1390	GAGUGGAG CUGAUGAG X CGAA AGGGUCAG	187	CTGACCCT C CTCCACTC	715
1393	GUGGAGUG CUGAUGAG X CGAA AGGAGGGU	188	ACCCTCCT C CACTCCAC	716
1398	UGGAGGUG CUGAUGAG X CGAA AGUGGAGG	189	CCTCCACT C CACCTCCA	717
1404	AGUGGGUG CUGAUGAG X CGAA AGGUGGAG	190	CTCCACCT C CACCCACT	718
1415	CAGAGGCG CUGAUGAG X CGAA ACAGUGGG	191	CCCACTGT C CGCCTCTG	719
1421	UGCGGGCA CUGAUGAG X CGAA AGGCGGAC	192	GTCCGCCT C TGCCCGCA	720
1446	AUGCCUGC CUGAUGAG X CGAA AGUCGGGC	193	GCCCGACT A GCAGGCAT	721
1463	CCCUUACC CUGAUGAG X CGAA ACCGCGGC	194	GCCGCGGT A GGTAAGGG	722
1467	GCGGCCCU CUGAUGAG X CGAA ACCUACCG	195	CGGTAGGT A AGGGCCGC	723
1486	CGGCUCUC CUGAUGAG X CGAA ACGCGGUC	196	GACCGCGT A GAGAGCCG	724
1511	GCAGAACC CUGAUGAG X CGAA ACGUCCGU	197	ACGGACGT T GGTTCTGC	725
1515	UAGUGCAG CUGAUGAG X CGAA ACCAACGU	198	ACGTTGGT T CTGCACTA	726
1516	UUAGUGCA CUGAUGAG X CGAA AACCAACG	199	CGTTGGTT C TGCACTAA	727
1523	AUGGGUUU CUGAUGAG X CGAA AGUGCAGA	200	TCTGCACT A AAACCCAT	728
1532	CCGGGGAA CUGAUGAG X CGAA AUGGGUUU	201	AAACCCAT C TTCCCCGG	729
1534	AUCCGGGG CUGAUGAG X CGAA AGAUGGGU	202	ACCCATCT T CCCCGGAT	730
1535	CAUCCGGG CUGAUGAG X CGAA AAGAUGGG	203	CCCATCTT C CCCGGATG	731
1549	AGGGGUGA CUGAUGAG X CGAA ACACACAU	204	ATGTGTGT C TCACCCCT	732
1551	UGAGGGGU CUGAUGAG X CGAA AGACACAC	205	GTGTGTCT C ACCCCTCA	733
1558	AAAAGGAU CUGAUGAG X CGAA AGGGGUGA	206	TCACCCCT C ATCCTTTT	734
1561	AGUAAAAG CUGAUGAG X CGAA AUGAGGGG	207	CCCCTCAT C CTTTTACT	735
1564	AAAAGUAA CUGAUGAG X CGAA AGGAUGAG	208	CTCATCCT T TTACTTTT	736
1565	AAAAAGUA CUGAUGAG X CGAA AAGGAUGA	209	TCATCCTT T TACTTTTT	737
1566	CAAAAAGU CUGAUGAG X CGAA AAAGGAUG	210	CATCCTTT T ACTTTTTG	738
1567	GCAAAAAG CUGAUGAG X CGAA AAAAGGAU	211	ATCCTTTT A CTTTTTGC	739
1570	GGGGCAAA CUGAUGAG X CGAA AGUAAAAG	212	CTTTTACT T TTTGCCCC	740
1571	AGGGGCAA CUGAUGAG X CGAA AAGUAAAA	213	TTTTACTT T TTGCCCCT	741
1572	AAGGGGCA CUGAUGAG X CGAA AAAGUAAA	214	TTTACTTT T TGCCCCTT	742
1573	GAAGGGGC CUGAUGAG X CGAA AAAAGUAA	215	TTACTTTT T GCCCCTTC	743
1580	CAAAGUGG CUGAUGAG X CGAA AGGGGCAA	216	TTGCCCCT T CCACTTTG	744
1581	UCAAAGUG CUGAUGAG X CGAA AAGGGGCA	217	TGCCCCTT C CACTTTGA	745
1586	GGUACUCA CUGAUGAG X CGAA AGUGGAAG	218	CTTCCACT T TGAGTACC	746
1587	UGGUACUC CUGAUGAG X CGAA AAGUGGAA	219	TTCCACTT T GAGTACCA	747
1592	GGAUUUGG CUGAUGAG X CGAA ACUCAAAG	220	CTTTGAGT A CCAAATCC	748
1599	GGCUUGUG CUGAUGAG X CGAA AUUUGGUA	221	TACCAAAT C CACAAGCC	749
1610	CCUCAAAA CUGAUGAG X CGAA AUGGCUUG	222	CAAGCCAT T TTTTGAGG	750
1611	UCCUCAAA CUGAUGAG X CGAA AAUGGCUU	223	AAGCCATT T TTTGAGGA	751
1612	CUCCUCAA CUGAUGAG X CGAA AAAUGGCU	224	AGCCATTT T TTGAGGAG	752
1613	UCUCCUCA CUGAUGAG X CGAA AAAAUGGC	225	GCCATTTT T TGAGGAGA	753
1614	CUCUCCUC CUGAUGAG X CGAA AAAAAUGG	226	CCATTTTT T GAGGAGAG	754
1634	CAGCAUGG CUGAUGAG X CGAA ACUCUCUU	227	AAGAGAGT A CCATGCTG	755
1665	GACGGGUG CUGAUGAG X CGAA AGGCCCCU	228	AGGGGCCT A CACCCGTC	756
1673	AGCCCCAA CUGAUGAG X CGAA ACGGGUGU	229	ACACCCGT C TTGGGGCT	757
1675	CGAGCCCC CUGAUGAG X CGAA AGACGGGU	230	ACCCGTCT T GGGGCTCG	758
1682	GGUGGGGC CUGAUGAG X CGAA AGCCCCAA	231	TTGGGGCT C GCCCCACC	759
1698	CCAGGAGG CUGAUGAG X CGAA AGCCCUGG	232	CCAGGGCT C CCTCCTGG	760

Table 3

1702	UGCUCCAG CUGAUGAG X CGAA AGGGAGCC	233	GGCTCCCT C CTGGAGCA	761
1712	CCGCCUGG CUGAUGAG X CGAA AUGCUCCA	234	TGGAGCAT C CCAGGCGG	762
1746	GCAGAUUC CUGAUGAG X CGAA AGGGGGGG	235	CCCCCCCT T GAATCTGC	763
1751	UCCCUGCA CUGAUGAG X CGAA AUUCAAGG	236	CCTTGAAT C TGCAGGGA	764
1766	GGAGUGGA CUGAUGAG X CGAA AGUUGCUC	237	GAGCAACT C TCCACTCC	765
1768	AUGGAGUG CUGAUGAG X CGAA AGAGUUGC	238	GCAACTCT C CACTCCAT	766
1773	UAAAUAUG CUGAUGAG X CGAA AGUGGAGA	239	TCTCCACT C CATATTTA	767
1777	UAAAUAAA CUGAUGAG X CGAA AUGGAGUG	240	CACTCCAT A TTTATTTA	768
1779	UUUAAAUA CUGAUGAG X CGAA AUAUGGAG	241	CTCCATAT T TATTTAAA	769
1780	GUUUAAAU CUGAUGAG X CGAA AAUAUGGA	242	TCCATATT T ATTTAAAC	770
1781	UGUUUAAA CUGAUGAG X CGAA AAAUAUGG	243	CCATATTT A TTTAAACA	771
1783	AUUGUUUA CUGAUGAG X CGAA AUAAAUAU	244	ATATTTAT T TAAACAAT	772
1784	AAUUGUUU CUGAUGAG X CGAA AAUAAAUA	245	TATTTATT T AAACAATT	773
1785	AAAUUGUU CUGAUGAG X CGAA AAAUAAAU	246	ATTTATTT A AACAATTT	774
1792	GGGGAAAA CUGAUGAG X CGAA AUUGUUUA	247	TAAACAAT T TTTTCCCC	775
1793	UGGGGAAA CUGAUGAG X CGAA AAUUGUUU	248	AAACAATT T TTTCCCCA	776
1794	UUGGGGAA CUGAUGAG X CGAA AAAUUGUU	249	AACAATTT T TTCCCCAA	777
1795	UUUGGGGA CUGAUGAG X CGAA AAAAUUGU	250	ACAATTTT T TCCCCAAA	778
1796	CUUUGGGG CUGAUGAG X CGAA AAAAAUUG	251	CAATTTTT T CCCCAAAG	779
1797	CCUUUGGG CUGAUGAG X CGAA AAAAAAUU	252	AATTTTTT C CCCAAAGG	780
1809	GCACUAUG CUGAUGAG X CGAA AUGCCUUU	253	AAAGGCAT C CATAGTGC	781
1813	UAGUGCAC CUGAUGAG X CGAA AUGGAUGC	254	GCATCCAT A GTGCACTA	782
1821	GAAAAUGC CUGAUGAG X CGAA AGUGCACU	255	AGTGCACT A GCATTTTC	783
1826	UUCAAGAA CUGAUGAG X CGAA AUGCUAGU	256	ACTAGCAT T TTCTTGAA	784
1827	GUUCAAGA CUGAUGAG X CGAA AAUGCUAG	257	CTAGCATT T TCTTGAAC	785
1828	GGUUCAAG CUGAUGAG X CGAA AAAUGCUA	258	TAGCATTT T CTTGAACC	786
1829	UGGUUCAA CUGAUGAG X CGAA AAAAUGCU	259	AGCATTTT C TTGAACCA	787
1831	AUUGGUUC CUGAUGAG X CGAA AGAAAAUG	260	CATTTTCT T GAACCAAT	788
1840	UAAUACAU CUGAUGAG X CGAA AUUGGUUC	261	GAACCAAT A ATGTATTA	789
1845	AAUUUUAA CUGAUGAG X CGAA ACAUUAUU	262	AATAATGT A TTAAAATT	790
1847	AAAAUUUU CUGAUGAG X CGAA AUACAUUA	263	TAATGTAT T AAAATTTT	791
1848	AAAAAUUU CUGAUGAG X CGAA AAUACAUU	264	AATGTATT A AAATTTTT	792
1853	CAUCAAAA CUGAUGAG X CGAA AUUUUAAU	265	ATTAAAAT T TTTTGATG	793
1854	ACAUCAAA CUGAUGAG X CGAA AAUUUUAA	266	TTAAAATT T TTTGATGT	794
1855	GACAUCAA CUGAUGAG X CGAA AAAUUUUA	267	TAAAATTT T TTGATGTC	795
1856	UGACAUCA CUGAUGAG X CGAA AAAAUUUU	268	AAAATTTT T TGATGTCA	796
1857	CUGACAUC CUGAUGAG X CGAA AAAAAUUU	269	AAATTTTT T GATGTCAG	797
1863	GCAAGGCU CUGAUGAG X CGAA ACAUCAAA	270	TTTGATGT C AGCCTTGC	798
1869	CUUGAUGC CUGAUGAG X CGAA AGGCUGAC	271	GTCAGCCT T GCATCAAG	799
1874	AAGCCCUU CUGAUGAG X CGAA AUGCAAGG	272	CCTTGCAT C AAGGGCTT	800
1882	UUUUGAUA CUGAUGAG X CGAA AGCCCUUG	273	CAAGGGCT T TATCAAAA	801
1883	UUUUUGAU CUGAUGAG X CGAA AAGCCCUU	274	AAGGGCTT T ATCAAAAA	802
1884	CUUUUUGA CUGAUGAG X CGAA AAAGCCCU	275	AGGGCTTT A TCAAAAAG	803
1886	UACUUUUU CUGAUGAG X CGAA AUAAAGCC	276	GGCTTTAT C AAAAAGTA	804
1894	UAUUAUUG CUGAUGAG X CGAA ACUUUUUG	277	CAAAAAGT A CAATAATA	805
1899	GGAUUUAU CUGAUGAG X CGAA AUUGUACU	278	AGTACAAT A ATAAATCC	806
1902	UGAGGAUU CUGAUGAG X CGAA AUUAUUGU	279	ACAATAAT A AATCCTCA	807

Table 3

1906	UACCUGAG CUGAUGAG X CGAA AUUUAUUA	280	TAATAAAT C CTCAGGTA	808
1909	UACUACCU CUGAUGAG X CGAA AGGAUUUA	281	TAAATCCT C AGGTAGTA	809
1914	CCCAGUAC CUGAUGAG X CGAA ACCUGAGG	282	CCTCAGGT A GTACTGGG	810
1917	AUUCCCAG CUGAUGAG X CGAA ACUACCUG	283	CAGGTAGT A CTGGGAAT	811
1934	CCAUGGCA CUGAUGAG X CGAA AGCCUUCC	284	GGAAGGCT T TGCCATGG	812
1935	CCCAUGGC CUGAUGAG X CGAA AAGCCUUC	285	GAAGGCTT T GCCATGGG	813
1954	ACUGGUCU CUGAUGAG X CGAA ACGCAGCA	286	TGCTGCGT C AGACCAGT	814
1963	CUUCCCAG CUGAUGAG X CGAA ACUGGUCU	287	AGACCAGT A CTGGGAAG	815
1981	CUGCUUAC CUGAUGAG X CGAA ACCGUCCU	288	AGGACGGT T GTAAGCAG	816
1984	CAACUGCU CUGAUGAG X CGAA ACAACCGU	289	ACGGTTGT A AGCAGTTG	817
1991	UAAAUAAC CUGAUGAG X CGAA ACUGCUUA	290	TAAGCAGT T GTTATTTA	818
1994	CACUAAAU CUGAUGAG X CGAA ACAACUGC	291	GCAGTTGT T ATTTAGTG	819
1995	UCACUAAA CUGAUGAG X CGAA AACAACUG	292	CAGTTGTT A TTTAGTGA	820
1997	UAUCACUA CUGAUGAG X CGAA AUAACAAC	293	GTTGTTAT T TAGTGATA	821
1998	AUAUCACU CUGAUGAG X CGAA AAUAACAA	294	TTGTTATT T AGTGATAT	822
1999	AAUAUCAC CUGAUGAG X CGAA AAAUAACA	295	TGTTATTT A GTGATATT	823
2005	ACCCACAA CUGAUGAG X CGAA AUCACUAA	296	TTAGTGAT A TTGTGGGT	824
2007	UUACCCAC CUGAUGAG X CGAA AUAUCACU	297	AGTGATAT T GTGGGTAA	825
2014	UCUCACGU CUGAUGAG X CGAA ACCCACAA	298	TTGTGGGT A ACGTGAGA	826
2027	CAUUGUUC CUGAUGAG X CGAA AUCUUCUC	299	GAGAAGAT A GAACAATG	827
2038	AUAUAUUA CUGAUGAG X CGAA AGCAUUGU	300	ACAATGCT A TAATATAT	828
2040	UUAUAUAU CUGAUGAG X CGAA AUAGCAUU	301	AATGCTAT A ATATATAA	829
2043	UCAUUAUA CUGAUGAG X CGAA AUUAUAGC	302	GCTATAAT A TATAATGA	830
2045	GUUCAUUA CUGAUGAG X CGAA AUAUUAUA	303	TATAATAT A TAATGAAC	831
2047	GUGUUCAU CUGAUGAG X CGAA AUAUAUUA	304	TAATATAT A ATGAACAC	832
2062	UUAUUAAA CUGAUGAG X CGAA ACCCACGU	305	ACGTGGGT A TTTAATAA	833
2064	UCUUAUUA CUGAUGAG X CGAA AUACCCAC	306	GTGGGTAT T TAATAAGA	834
2065	UUCUUAUU CUGAUGAG X CGAA AAUACCCA	307	TGGGTATT T AATAAGAA	835
2066	UUUCUUAU CUGAUGAG X CGAA AAAUACCC	308	GGGTATTT A ATAAGAAA	836
2069	AUGUUUCU CUGAUGAG X CGAA AUUAAAUA	309	TATTTAAT A AGAAACAT	837
2088	GACAAAGU CUGAUGAG X CGAA AUCUCACA	310	TGTGAGAT T ACTTTGTC	838
2089	GGACAAAG CUGAUGAG X CGAA AAUCUCAC	311	GTGAGATT A CTTTGTCC	839
2092	GCGGGACA CUGAUGAG X CGAA AGUAAUCU	312	AGATTACT T TGTCCCGC	840
2093	AGCGGGAC CUGAUGAG X CGAA AAGUAAUC	313	GATTACTT T GTCCCGCT	841
2096	AUAAGCGG CUGAUGAG X CGAA ACAAAGUA	314	TACTTTGT C CCGCTTAT	842
2102	AGCAGAAU CUGAUGAG X CGAA AGCGGGAC	315	GTCCCGCT T ATTCTGCT	843
2103	GAGCAGAA CUGAUGAG X CGAA AAGCGGGA	316	TCCCGCTT A TTCTGCTC	844
2105	GGGAGCAG CUGAUGAG X CGAA AUAAGCGG	317	CCGCTTAT T CTGCTCCC	845
2106	AGGGAGCA CUGAUGAG X CGAA AAUAAGCG	318	CGCTTATT C TGCTCCCT	846
2111	AUAACAGG CUGAUGAG X CGAA AGCAGAAU	319	ATTCTGCT C CCTGTTAT	847
2117	UAGCAGAU CUGAUGAG X CGAA ACAGGGAG	320	CTCCCTGT T ATCTGCTA	848
2118	CUAGCAGA CUGAUGAG X CGAA AACAGGGA	321	TCCCTGTT A TCTGCTAG	849
2120	AUCUAGCA CUGAUGAG X CGAA AUAACAGG	322	CCTGTTAT C TGCTAGAT	850
2125	ACUAGAUC CUGAUGAG X CGAA AGCAGAUA	323	TATCTGCT A GATCTAGT	851
2129	GAGAACUA CUGAUGAG X CGAA AUCUAGCA	324	TGCTAGAT C TAGTTCTC	852
2131	UUGAGAAC CUGAUGAG X CGAA AGAUCUAG	325	CTAGATCT A GTTCTCAA	853
2134	UGAUUGAG CUGAUGAG X CGAA ACUAGAUC	326	GATCTAGT T CTCAATCA	854

Table 3

2135	GUGAUUGA CUGAUGAG X CGAA AACUAGAU	327	ATCTAGTT C TCAATCAC	855
2137	CAGUGAUU CUGAUGAG X CGAA AGAACUAG	328	CTAGTTCT C AATCACTG	856
2141	GGAGCAGU CUGAUGAG X CGAA AUUGAGAA	329	TTCTCAAT C ACTGCTCC	857
2148	ACACGGGG CUGAUGAG X CGAA AGCAGUGA	330	TCACTGCT C CCCCGTGT	858
2159	CAUUCUAA CUGAUGAG X CGAA ACACACGG	331	CCGTGTGT A TTAGAATG	859
2161	UGCAUUCU CUGAUGAG X CGAA AUACACAC	332	GTGTGTAT T AGAATGCA	860
2162	AUGCAUUC CUGAUGAG X CGAA AAUACACA	333	TGTGTATT A GAATGCAT	861
2173	GAAGACCU CUGAUGAG X CGAA ACAUGCAU	334	ATGCATGT A AGGTCTTC	862
2178	CACAAGAA CUGAUGAG X CGAA ACCUUACA	335	TGTAAGGT C TTCTTGTG	863
2180	GACACAAG CUGAUGAG X CGAA AGACCUUA	336	TAAGGTCT T CTTGTGTC	864
2181	GGACACAA CUGAUGAG X CGAA AAGACCUU	337	AAGGTCTT C TTGTGTCC	865
2183	CAGGACAC CUGAUGAG X CGAA AGAAGACC	338	GGTCTTCT T GTGTCCTG	866
2188	UUCAUCAG CUGAUGAG X CGAA ACACAAGA	339	TCTTGTGT C CTGATGAA	867
2201	CAAGCACA CUGAUGAG X CGAA AUUUUUCA	340	TGAAAAAT A TGTGCTTG	868
2208	CUCAUUUC CUGAUGAG X CGAA AGCACAUA	341	TATGTGCT T GAAATGAG	869
2222	AGAGAUCA CUGAUGAG X CGAA AGUUUCUC	342	GAGAAACT T TGATCTCT	870
2223	CAGAGAUC CUGAUGAG X CGAA AAGUUUCU	343	AGAAACTT T GATCTCTG	871
2227	UAAGCAGA CUGAUGAG X CGAA AUCAAAGU	344	ACTTTGAT C TCTGCTTA	872
2229	AGUAAGCA CUGAUGAG X CGAA AGAUCAAA	345	TTTGATCT C TGCTTACT	873
2234	ACAUUAGU CUGAUGAG X CGAA AGCAGAGA	346	TCTCTGCT T ACTAATGT	874
2235	CACAUUAG CUGAUGAG X CGAA AAGCAGAG	347	CTCTGCTT A CTAATGTG	875
2238	GGGCACAU CUGAUGAG X CGAA AGUAAGCA	348	TGCTTACT A ATGTGCCC	876
2252	UGGACUUG CUGAUGAG X CGAA ACAUGGGG	349	CCCCATGT C CAAGTCCA	877
2258	GCAGGUUG CUGAUGAG X CGAA ACUUGGAC	350	GTCCAAGT C CAACCTGC	878
2283	CAUGUAAU CUGAUGAG X CGAA AUCAGGUC	351	GACCTGAT C ATTACATG	879
2286	AGCCAUGU CUGAUGAG X CGAA AUGAUCAG	352	CTGATCAT T ACATGGCT	880
2287	CAGCCAUG CUGAUGAG X CGAA AAUGAUCA	353	TGATCATT A CATGGCTG	881
2300	GGCUUAGG CUGAUGAG X CGAA ACCACAGC	354	GCTGTGGT T CCTAAGCC	882
2301	AGGCUUAG CUGAUGAG X CGAA AACCACAG	355	CTGTGGTT C CTAAGCCT	883
2304	AACAGGCU CUGAUGAG X CGAA AGGAACCA	356	TGGTTCCT A AGCCTGTT	884
2312	ACUUCAGC CUGAUGAG X CGAA ACAGGCUU	357	AAGCCTGT T GCTGAAGT	885
2321	GCGACAAU CUGAUGAG X CGAA ACUUCAGC	358	GCTGAAGT C ATTGTCGC	886
2324	UGAGCGAC CUGAUGAG X CGAA AUGACUUC	359	GAAGTCAT T GTCGCTCA	887
2327	UGCUGAGC CUGAUGAG X CGAA ACAAUGAC	360	GTCATTGT C GCTCAGCA	888
2331	CUAUUGCU CUGAUGAG X CGAA AGCGACAA	361	TTGTCGCT C AGCAATAG	889
2338	CUGCACCC CUGAUGAG X CGAA AUUGCUGA	362	TCAGCAAT A GGGTGCAG	890
2348	UCCUGGAA CUGAUGAG X CGAA ACUGCACC	363	GGTGCAGT T TTCCAGGA	891
2349	UUCCUGGA CUGAUGAG X CGAA AACUGCAC	364	GTGCAGTT T TCCAGGAA	892
2350	AUUCCUGG CUGAUGAG X CGAA AAACUGCA	365	TGCAGTTT T CCAGGAAT	893
2351	UAUUCCUG CUGAUGAG X CGAA AAAACUGC	366	GCAGTTTT C CAGGAATA	894
2359	CAAAUGCC CUGAUGAG X CGAA AUUCCUGG	367	CCAGGAAT A GGCATTTG	895
2365	AUUAGGCA CUGAUGAG X CGAA AUGCCUAU	368	ATAGGCAT T TGCCTAAT	896
2366	AAUUAGGC CUGAUGAG X CGAA AAUGCCUA	369	TAGGCATT T GCCTAATT	897
2371	CCAGGAAU CUGAUGAG X CGAA AGGCAAAU	370	ATTTGCCT A ATTCCTGG	898
2374	AUGCCAGG CUGAUGAG X CGAA AUUAGGCA	371	TGCCTAAT T CCTGGCAT	899
2375	CAUGCCAG CUGAUGAG X CGAA AAUUAGGC	372	GCCTAATT C CTGGCATG	900
2389	AGUCACUA CUGAUGAG X CGAA AGUGUCAU	373	ATGACACT C TAGTGACT	901

Table 3

2391	GAAGUCAC CUGAUGAG X CGAA AGAGUGUC	374	GACACTCT A GTGACTTC	902
2398	UCACCAGG CUGAUGAG X CGAA AGUCACUA	375	TAGTGACT T CCTGGTGA	903
2399	CUCACCAG CUGAUGAG X CGAA AAGUCACU	376	AGTGACTT C CTGGTGAG	904
2419	UGUACCAG CUGAUGAG X CGAA ACAGGCUG	377	CAGCCTGT C CTGGTACA	905
2425	CCCUGCUG CUGAUGAG X CGAA ACCAGGAC	378	GTCCTGGT A CAGCAGGG	906
2435	UACAGCAA CUGAUGAG X CGAA ACCCUGCU	379	AGCAGGGT C TTGCTGTA	907
2437	GUUACAGC CUGAUGAG X CGAA AGACCCUG	380	CAGGGTCT T GCTGTAAC	908
2443	GUCUGAGU CUGAUGAG X CGAA ACAGCAAG	381	CTTGCTGT A ACTCAGAC	909
2447	GAAUGUCU CUGAUGAG X CGAA AGUUACAG	382	CTGTAACT C AGACATTC	910
2454	ACCCUUGG CUGAUGAG X CGAA AUGUCUGA	383	TCAGACAT T CCAAGGGT	911
2455	UACCCUUG CUGAUGAG X CGAA AAUGUCUG	384	CAGACATT C CAAGGGTA	912
2463	GCUUCCCA CUGAUGAG X CGAA ACCCUUGG	385	CCAAGGGT A TGGGAAGC	913
2475	GGUGUGAA CUGAUGAG X CGAA AUGGCUUC	386	GAAGCCAT A TTCACACC	914
2477	GAGGUGUG CUGAUGAG X CGAA AUAUGGCU	387	AGCCATAT T CACACCTC	915
2478	UGAGGUGU CUGAUGAG X CGAA AAUAUGGC	388	GCCATATT C ACACCTCA	916
2485	CAGAGCGU CUGAUGAG X CGAA AGGUGUGA	389	TCACACCT C ACGCTCTG	917
2491	CAUGUCCA CUGAUGAG X CGAA AGCGUGAG	390	CTCACGCT C TGGACATG	918
2502	CUUCCCUA CUGAUGAG X CGAA AUCAUGUC	391	GACATGAT T TAGGGAAG	919
2503	GCUUCCCU CUGAUGAG X CGAA AAUCAUGU	392	ACATGATT T AGGGAAGC	920
2504	UGCUUCCC CUGAUGAG X CGAA AAAUCAUG	393	CATGATTT A GGGAAGCA	921
2536	UGAUCCCA CUGAUGAG X CGAA AGGUGGGG	394	CCCCACCT T TGGGATCA	922
2537	CUGAUCCC CUGAUGAG X CGAA AAGGUGGG	395	CCCACCTT T GGGATCAG	923
2543	CGGAGGCU CUGAUGAG X CGAA AUCCCAAA	396	TTTGGGAT C AGCCTCCG	924
2549	GAAUGGCG CUGAUGAG X CGAA AGGCUGAU	397	ATCAGCCT C CGCCATTC	925
2556	CGACUUGG CUGAUGAG X CGAA AUGGCGGA	398	TCCGCCAT T CCAAGTCG	926
2557	UCGACUUG CUGAUGAG X CGAA AAUGGCGG	399	CCGCCATT C CAAGTCGA	927
2563	AGAGUGUC CUGAUGAG X CGAA ACUUGGAA	400	TTCCAAGT C GACACTCT	928
2570	CUCAAGAA CUGAUGAG X CGAA AGUGUCGA	401	TCGACACT C TTCTTGAG	929
2572	UGCUCAAG CUGAUGAG X CGAA AGAGUGUC	402	GACACTCT T CTTGAGCA	930
2573	CUGCUCAA CUGAUGAG X CGAA AAGAGUGU	403	ACACTCTT C TTGAGCAG	931
2575	GUCUGCUC CUGAUGAG X CGAA AGAAGAGU	404	ACTCTTCT T GAGCAGAC	932
2590	CUCUUCCA CUGAUGAG X CGAA AUCACGGU	405	ACCGTGAT T TGGAAGAG	933
2591	UCUCUUCC CUGAUGAG X CGAA AAUCACGG	406	CCGTGATT T GGAAGAGA	934
2622	GUUUCAAG CUGAUGAG X CGAA AGUGUGGU	407	ACCACACT T CTTGAAAC	935
2623	UGUUUCAA CUGAUGAG X CGAA AAGUGUGG	408	CCACACTT C TTGAAACA	936
2625	GCUGUUUC CUGAUGAG X CGAA AGAAGUGU	409	ACACTTCT T GAAACAGC	937
2646	GCCUAAAG CUGAUGAG X CGAA ACCGUCAC	410	GTGACGGT C CTTTAGGC	938
2649	GCUGCCUA CUGAUGAG X CGAA AGGACCGU	411	ACGGTCCT T TAGGCAGC	939
2650	GGCUGCCU CUGAUGAG X CGAA AAGGACCG	412	CGGTCCTT T AGGCAGCC	940
2651	AGGCUGCC CUGAUGAG X CGAA AAAGGACC	413	GGTCCTTT A GGCAGCCT	941
2668	GGGACAGA CUGAUGAG X CGAA ACGGCGGC	414	GCCGCCGT C TCTGTCCC	942
2670	CCGGGACA CUGAUGAG X CGAA AGACGGCG	415	CGCCGTCT C TGTCCCGG	943
2674	UGAACCGG CUGAUGAG X CGAA ACAGAGAC	416	GTCTCTGT C CCGGTTCA	944
2680	GCAAGGUG CUGAUGAG X CGAA ACCGGGAC	417	GTCCCGGT T CACCTTGC	945
2681	GGCAAGGU CUGAUGAG X CGAA AACCGGGA	418	TCCCGGTT C ACCTTGCC	946
2686	CUCUCGGC CUGAUGAG X CGAA AGGUGAAC	419	GTTCACCT T GCCGAGAG	947
2703	GUGGGGCA CUGAUGAG X CGAA ACGCGCCU	420	AGGCGCGT C TGCCCCAC	948

Table 3

2715	CAGGGUUU CUGAUGAG X CGAA AGGGUGGG	421	CCCACCCT C AAACCCTG	949
2741	AGAGUCGU CUGAUGAG X CGAA AGCACCAU	422	ATGGTGCT C ACGACTCT	950
2748	UGCAGGAA CUGAUGAG X CGAA AGUCGUGA	423	TCACGACT C TTCCTGCA	951
2750	UUUGCAGG CUGAUGAG X CGAA AGAGUCGU	424	ACGACTCT T CCTGCAAA	952
2751	CUUUGCAG CUGAUGAG X CGAA AAGAGUCG	425	CGACTCTT C CTGCAAAG	953
2774	UUAAUGUG CUGAUGAG X CGAA AGGUCUUC	426	GAAGACCT C CACATTAA	954
2780	AGCCACUU CUGAUGAG X CGAA AUGUGGAG	427	CTCCACAT T AAGTGGCT	955
2781	AAGCCACU CUGAUGAG X CGAA AAUGUGGA	428	TCCACATT A AGTGGCTT	956
2789	AUGUUAAA CUGAUGAG X CGAA AGCCACUU	429	AAGTGGCT T TTTAACAT	957
2790	CAUGUUAA CUGAUGAG X CGAA AAGCCACU	430	AGTGGCTT T TTAACATG	958
2791	UCAUGUUA CUGAUGAG X CGAA AAAGCCAC	431	GTGGCTTT T TAACATGA	959
2792	UUCAUGUU CUGAUGAG X CGAA AAAAGCCA	432	TGGCTTTT T AACATGAA	960
2793	UUUCAUGU CUGAUGAG X CGAA AAAAAGCC	433	GGCTTTTT A ACATGAAA	961
2816	UCGGGAGC CUGAUGAG X CGAA ACAGCUGC	434	GCAGCTGT A GCTCCCGA	962
2820	UAGCUCGG CUGAUGAG X CGAA AGCUACAG	435	CTGTAGCT C CCGAGCTA	963
2828	CAAGAGAG CUGAUGAG X CGAA AGCUCGGG	436	CCCGAGCT A CTCTCTTG	964
2831	UGGCAAGA CUGAUGAG X CGAA AGUAGCUC	437	GAGCTACT C TCTTGCCA	965
2833	GCUGGCAA CUGAUGAG X CGAA AGAGUAGC	438	GCTACTCT C TTGCCAGC	966
2835	AUGCUGGC CUGAUGAG X CGAA AGAGAGUA	439	TACTCTCT T GCCAGCAT	967
2844	AAUGUGAA CUGAUGAG X CGAA AUGCUGGC	440	GCCAGCAT T TTCACATT	968
2845	AAAUGUGA CUGAUGAG X CGAA AAUGCUGG	441	CCAGCATT T TCACATTT	969
2846	AAAAUGUG CUGAUGAG X CGAA AAAUGCUG	442	CAGCATTT T CACATTTT	970
2847	CAAAAUGU CUGAUGAG X CGAA AAAAUGCU	443	AGCATTTT C ACATTTTG	971
2852	AAAGGCAA CUGAUGAG X CGAA AUGUGAAA	444	TTTCACAT T TTGCCTTT	972
2853	GAAAGGCA CUGAUGAG X CGAA AAUGUGAA	445	TTCACATT T TGCCTTTC	973
2854	AGAAAGGC CUGAUGAG X CGAA AAAUGUGA	446	TCACATTT T GCCTTTCT	974
2859	CCACGAGA CUGAUGAG X CGAA AGGCAAAA	447	TTTTGCCT T TCTCGTGG	975
2860	ACCACGAG CUGAUGAG X CGAA AAGGCAAA	448	TTTGCCTT T CTCGTGGT	976
2861	UACCACGA CUGAUGAG X CGAA AAAGGCAA	449	TTGCCTTT C TCGTGGTA	977
2863	UCUACCAC CUGAUGAG X CGAA AGAAAGGC	450	GCCTTTCT C GTGGTAGA	978
2869	CUGGCUUC CUGAUGAG X CGAA ACCACGAG	451	CTCGTGGT A GAAGCCAG	979
2879	UUUCUCUG CUGAUGAG X CGAA ACUGGCUU	452	AAGCCAGT A CAGAGAAA	980
2889	CACCACAG CUGAUGAG X CGAA AUUUCUCU	453	AGAGAAAT T CTGTGGTG	981
2890	CCACCACA CUGAUGAG X CGAA AAUUUCUC	454	GAGAAATT C TGTGGTGG	982
2905	ACACCUCG CUGAUGAG X CGAA AUGUUCCC	455	GGGAACAT T CGAGGTGT	983
2906	GACACCUC CUGAUGAG X CGAA AAUGUUCC	456	GGAACATT C GAGGTGTC	984
2914	UGCAGGGU CUGAUGAG X CGAA ACACCUCG	457	CGAGGTGT C ACCCTGCA	985
2928	CCUCACCA CUGAUGAG X CGAA AGCUCUGC	458	GCAGAGCT A TGGTGAGG	986
2944	CUAAGCCU CUGAUGAG X CGAA AUCCACAC	459	GTGTGGAT A AGGCTTAG	987
2950	UGGCACCU CUGAUGAG X CGAA AGCCUUAU	460	ATAAGGCT T AGGTGCCA	988
2951	CUGGCACC CUGAUGAG X CGAA AAGCCUUA	461	TAAGGCTT A GGTGCCAG	989
2965	AGAAUGCU CUGAUGAG X CGAA ACAGCCUG	462	CAGGCTGT A AGCATTCT	990
2971	CAGCUCAG CUGAUGAG X CGAA AUGCUUAC	463	GTAAGCAT T CTGAGCTG	991
2972	CCAGCUCA CUGAUGAG X CGAA AAUGCUUA	464	TAAGCATT C TGAGCTGG	992
2983	AAAACAAC CUGAUGAG X CGAA AGCCAGCU	465	AGCTGGCT T GTTGTTTT	993
2986	UUAAAAAC CUGAUGAG X CGAA ACAAGCCA	466	TGGCTTGT T GTTTTTAA	994
2989	GACUUAAA CUGAUGAG X CGAA ACAACAAG	467	CTTGTTGT T TTTAAGTC	995

Table 3

2990	GGACUUAA CUGAUGAG X CGAA AACAACAA	468	TTGTTGTT T TTAAGTCC	996
2991	AGGACUUA CUGAUGAG X CGAA AAACAACA	469	TGTTGTTT T TAAGTCCT	997
2992	CAGGACUU CUGAUGAG X CGAA AAAACAAC	470	GTTGTTTT T AAGTCCTG	998
2993	ACAGGACU CUGAUGAG X CGAA AAAAACAA	471	TTGTTTTT A AGTCCTGT	999
2997	AUAUACAG CUGAUGAG X CGAA ACUUAAAA	472	TTTTAAGT C CTGTATAT	1000
3002	CAUACAUA CUGAUGAG X CGAA ACAGGACU	473	AGTCCTGT A TATGTATG	1001
3004	UACAUACA CUGAUGAG X CGAA AUACAGGA	474	TCCTGTAT A TGTATGTA	1002
3008	CUACUACA CUGAUGAG X CGAA ACAUAUAC	475	GTATATGT A TGTAGTAG	1003
3012	CAAACUAC CUGAUGAG X CGAA ACAUACAU	476	ATGTATGT A GTAGTTTG	1004
3015	ACCCAAAC CUGAUGAG X CGAA ACUACAUA	477	TATGTAGT A GTTTGGGT	1005
3018	CACACCCA CUGAUGAG X CGAA ACUACUAC	478	GTAGTAGT T TGGGTGTG	1006
3019	ACACACCC CUGAUGAG X CGAA AACUACUA	479	TAGTAGTT T GGGTGTGT	1007
3028	ACUAUAUA CUGAUGAG X CGAA ACACACCC	480	GGGTGTGT A TATATAGT	1008
3030	CUACUAUA CUGAUGAG X CGAA AUACACAC	481	GTGTGTAT A TATAGTAG	1009
3032	UGCUACUA CUGAUGAG X CGAA AUAUACAC	482	GTGTATAT A TAGTAGCA	1010
3034	AAUGCUAC CUGAUGAG X CGAA AUAUAUAC	483	GTATATAT A GTAGCATT	1011
3037	UGAAAUGC CUGAUGAG X CGAA ACUAUAUA	484	TATATAGT A GCATTTCA	1012
3042	CAUUUUGA CUGAUGAG X CGAA AUGCUACU	485	AGTAGCAT T TCAAAATG	1013
3043	CCAUUUUG CUGAUGAG X CGAA AAUGCUAC	486	GTAGCATT T CAAAATGG	1014
3044	UCCAUUUU CUGAUGAG X CGAA AAAUGCUA	487	TAGCATTT C AAAATGGA	1015
3056	UAAACCAG CUGAUGAG X CGAA ACGUCCAU	488	ATGGACGT A CTGGTTTA	1016
3062	GGAGGUUA CUGAUGAG X CGAA ACCAGUAC	489	GTACTGGT T TAACCTCC	1017
3063	AGGAGGUU CUGAUGAG X CGAA AACCAGUA	490	TACTGGTT T AACCTCCT	1018
3064	UAGGAGGU CUGAUGAG X CGAA AAACCAGU	491	ACTGGTTT A ACCTCCTA	1019
3069	AAGGAUAG CUGAUGAG X CGAA AGGUUAAA	492	TTTAACCT C CTATCCTT	1020
3072	UCCAAGGA CUGAUGAG X CGAA AGGAGGUU	493	AACCTCCT A TCCTTGGA	1021
3074	UCUCCAAG CUGAUGAG X CGAA AUAGGAGG	494	CCTCCTAT C CTTGGAGA	1022
3077	UGCUCUCC CUGAUGAG X CGAA AGGAUAGG	495	CCTATCCT T GGAGAGCA	1023
3093	AAGGUGGA CUGAUGAG X CGAA AGCCAGCU	496	AGCTGGCT C TCCACCTT	1024
3095	ACAAGGUG CUGAUGAG X CGAA AGAGCCAG	497	CTGGCTCT C CACCTTGT	1025
3101	UGUGUAAC CUGAUGAG X CGAA AGGUGGAG	498	CTCCACCT T GTTACACA	1026
3104	UAAUGUGU CUGAUGAG X CGAA ACAAGGUG	499	CACCTTGT T ACACATTA	1027
3105	AUAAUGUG CUGAUGAG X CGAA AACAAGGU	500	ACCTTGTT A CACATTAT	1028
3111	UCUAACAU CUGAUGAG X CGAA AUGUGUAA	501	TTACACAT T ATGTTAGA	1029
3112	CUCUAACA CUGAUGAG X CGAA AAUGUGUA	502	TACACATT A TGTTAGAG	1030
3116	ACCUCUCU CUGAUGAG X CGAA ACAUAAUG	503	CATTATGT T AGAGAGGT	1031
3117	UACCUCUC CUGAUGAG X CGAA AACAUAAU	504	ATTATGTT A GAGAGGTA	1032
3125	CAGCUCGC CUGAUGAG X CGAA ACCUCUCU	505	AGAGAGGT A GCGAGCTG	1033
3136	ACAUAGCA CUGAUGAG X CGAA AGCAGCUC	506	GAGCTGCT C TGCTATGT	1034
3141	UAAGGACA CUGAUGAG X CGAA AGCAGAGC	507	GCTCTGCT A TGTCCTTA	1035
3145	GGCUUAAG CUGAUGAG X CGAA ACAUAGCA	508	TGCTATGT C CTTAAGCC	1036
3148	AUUGGCUU CUGAUGAG X CGAA AGGACAUA	509	TATGTCCT T AAGCCAAT	1037
3149	UAUUGGCU CUGAUGAG X CGAA AAGGACAU	510	ATGTCCTT A AGCCAATA	1038
3157	UGAGUAAA CUGAUGAG X CGAA AUUGGCUU	511	AAGCCAAT A TTTACTCA	1039
3159	GAUGAGUA CUGAUGAG X CGAA AUAUUGGC	512	GCCAATAT T TACTCATC	1040
3160	UGAUGAGU CUGAUGAG X CGAA AAUAUUGG	513	CCAATATT T ACTCATCA	1041
3161	CUGAUGAG CUGAUGAG X CGAA AAAUAUUG	514	CAATATTT A CTCATCAG	1042

Table 3

3164	GACCUGAU CUGAUGAG X CGAA AGUAAAUA	515	TATTTACT C ATCAGGTC	1043
3167	AAUGACCU CUGAUGAG X CGAA AUGAGUAA	516	TTACTCAT C AGGTCATT	1044
3172	AAAAUAAU CUGAUGAG X CGAA ACCUGAUG	517	CATCAGGT C ATTATTTT	1045
3175	UAAAAAAU CUGAUGAG X CGAA AUGACCUG	518	CAGGTCAT T ATTTTTTA	1046
3176	GUAAAAAA CUGAUGAG X CGAA AAUGACCU	519	AGGTCATT A TTTTTTAC	1047
3178	UUGUAAAA CUGAUGAG X CGAA AUAAUGAC	520	GTCATTAT T TTTTACAA	1048
3179	AUUGUAAA CUGAUGAG X CGAA AAUAAUGA	521	TCATTATT T TTTACAAT	1049
3180	CAUUGUAA CUGAUGAG X CGAA AAAUAAUG	522	CATTATTT T TTACAATG	1050
3181	CCAUUGUA CUGAUGAG X CGAA AAAAUAAU	523	ATTATTTT T TACAATGG	1051
3182	GCCAUUGU CUGAUGAG X CGAA AAAAAUAA	524	TTATTTTT T ACAATGGC	1052
3183	GGCCAUUG CUGAUGAG X CGAA AAAAAAUA	525	TATTTTTT A CAATGGCC	1053
3199	AAAUGGUU CUGAUGAG X CGAA AUUCCAUG	526	CATGGAAT A AACCATTT	1054
3206	UUUGUAAA CUGAUGAG X CGAA AUGGUUUA	527	TAAACCAT T TTTACAAA	1055
3207	UUUUGUAA CUGAUGAG X CGAA AAUGGUUU	528	AAACCATT T TTACAAAA	1056

Input Sequence = PTPN1 (Homo sapiens protein tyrosine phosphatase, non-receptor type 1 (PTPN1) 3215 bp)

Cut Site = UH.

Table 4

Table 4: Human PTP-1B NCH Ribozyme and Target Sequence

Nt. Position	Ribozyme Sequence	Seq. ID Nos.	Substrate Sequence	Seq. ID Nos.
13	CCGCUCUA CUGAUGAG X CGAA ICCGCGUC	1057	GACGCGGC C TAGAGCGG	1781
14	GCCGCUCU CUGAUGAG X CGAA IGCCGCGU	1058	ACGCGGCC T AGAGCGGC	1782
23	GCGCCGUC CUGAUGAG X CGAA ICCGCUCU	1059	AGAGCGGC A GACGGCGC	1783
32	CGGCCCAC CUGAUGAG X CGAA ICGCCGUC	1060	GACGGCGC A GTGGGCCG	1784
39	UCCUUCUC CUGAUGAG X CGAA ICCCACUG	1061	CAGTGGGC C GAGAAGGA	1785
53	GCGGCUGC CUGAUGAG X CGAA ICGCCUCC	1062	GGAGGCGC A GCAGCCGC	1786
56	AGGGCGGC CUGAUGAG X CGAA ICUGCGCC	1063	GGCGCAGC A GCCGCCCT	1787
59	GCCAGGGC CUGAUGAG X CGAA ICUGCUGC	1064	GCAGCAGC C GCCCTGGC	1788
62	CGGGCCAG CUGAUGAG X CGAA ICGGCUGC	1065	GCAGCCGC C CTGGCCCG	1789
63	ACGGGCCA CUGAUGAG X CGAA IGCGGCUG	1066	CAGCCGCC C TGGCCCGT	1790
64	GACGGGCC CUGAUGAG X CGAA IGGCGGCU	1067	AGCCGCCC T GGCCCGTC	1791
68	CCAUGACG CUGAUGAG X CGAA ICCAGGGC	1068	GCCCTGGC C CGTCATGG	1792
69	UCCAUGAC CUGAUGAG X CGAA IGCCAGGG	1069	CCCTGGCC C GTCATGGA	1793
73	CAUCUCCA CUGAUGAG X CGAA IACGGGCC	1070	GGCCCGTC A TGGAGATG	1794
98	UGUCGAUC CUGAUGAG X CGAA ICUCGAAC	1071	GTTCGAGC A GATCGACA	1795
106	CCCGGACU CUGAUGAG X CGAA IUCGAUCU	1072	AGATCGAC A AGTCCGGG	1796
111	CAGCUCCC CUGAUGAG X CGAA IACUUGUC	1073	GACAAGTC C GGGAGCTG	1797
118	GGCCGCCC CUGAUGAG X CGAA ICUCCCGG	1074	CCGGGAGC T GGGCGGCC	1798
126	UGGUAAAU CUGAUGAG X CGAA ICCGCCCA	1075	TGGGCGGC C ATTTACCA	1799
127	CUGGUAAA CUGAUGAG X CGAA IGCCGCCC	1076	GGGCGGCC A TTTACCAG	1800
133	GAUAUCCU CUGAUGAG X CGAA IUAAAUGG	1077	CCATTTAC C AGGATATC	1801
134	GGAUAUCC CUGAUGAG X CGAA IGUAAAUG	1078	CATTTACC A GGATATCC	1802
142	UUCAUGUC CUGAUGAG X CGAA IAUAUCCU	1079	AGGATATC C GACATGAA	1803
146	UGGCUUCA CUGAUGAG X CGAA IUCGGAUA	1080	TATCCGAC A TGAAGCCA	1804
153	AAGUCACU CUGAUGAG X CGAA ICUUCAUG	1081	CATGAAGC C AGTGACTT	1805
154	GAAGUCAC CUGAUGAG X CGAA IGCUUCAU	1082	ATGAAGCC A GTGACTTC	1806
160	ACAUGGGA CUGAUGAG X CGAA IUCACUGG	1083	CCAGTGAC T TCCCATGT	1807
163	UCUACAUG CUGAUGAG X CGAA IAAGUCAC	1084	GTGACTTC C CATGTAGA	1808
164	CUCUACAU CUGAUGAG X CGAA IGAAGUCA	1085	TGACTTCC C ATGTAGAG	1809
165	ACUCUACA CUGAUGAG X CGAA IGGAAGUC	1086	GACTTCCC A TGTAGAGT	1810
177	GGAAGCUU CUGAUGAG X CGAA ICCACUCU	1087	AGAGTGGC C AAGCTTCC	1811
178	AGGAAGCU CUGAUGAG X CGAA IGCCACUC	1088	GAGTGGCC A AGCTTCCT	1812
182	UCUUAGGA CUGAUGAG X CGAA ICUUGGCC	1089	GGCCAAGC T TCCTAAGA	1813
185	UGUUCUUA CUGAUGAG X CGAA IAAGCUUG	1090	CAAGCTTC C TAAGAACA	1814
186	UUGUUCUU CUGAUGAG X CGAA IGAAGCUU	1091	AAGCTTCC T AAGAACAA	1815
193	UCGGUUUU CUGAUGAG X CGAA IUUCUUAG	1092	CTAAGAAC A AAAACCGA	1816
199	CCUAUUUC CUGAUGAG X CGAA IUUUUUGU	1093	ACAAAAAC C GAAATAGG	1817
211	GACGUCUC CUGAUGAG X CGAA IUACCUAU	1094	ATAGGTAC A GAGACGTC	1818
220	AAAGGGAC CUGAUGAG X CGAA IACGUCUC	1095	GAGACGTC A GTCCCTTT	1819
224	GGUCAAAG CUGAUGAG X CGAA IACUGACG	1096	CGTCAGTC C CTTTGACC	1820
225	UGGUCAAA CUGAUGAG X CGAA IGACUGAC	1097	GTCAGTCC C TTTGACCA	1821
226	AUGGUCAA CUGAUGAG X CGAA IGGACUGA	1098	TCAGTCCC T TTGACCAT	1822
232	CCGACUAU CUGAUGAG X CGAA IUCAAAGG	1099	CCTTTGAC C ATAGTCGG	1823

Table 4

233	UCCGACUA CUGAUGAG X CGAA IGUCAAAG	1100	CTTTGACC A TAGTCGGA	1824
248	CUUGAUGU CUGAUGAG X CGAA IUUUAAUC	1101	GATTAAAC T ACATCAAG	1825
251	CUUCUUGA CUGAUGAG X CGAA IUAGUUUA	1102	TAAACTAC A TCAAGAAG	1826
254	UAUCUUCU CUGAUGAG X CGAA IAUGUAGU	1103	ACTACATC A AGAAGATA	1827
268	GUUGAUAU CUGAUGAG X CGAA IUCAUUAU	1104	ATAATGAC T ATATCAAC	1828
274	ACUAGCGU CUGAUGAG X CGAA IAUAUAGU	1105	ACTATATC A ACGCTAGT	1829
279	AUCAAACU CUGAUGAG X CGAA ICGUUGAU	1106	ATCAACGC T AGTTTGAT	1830
303	CUCCUUUG CUGAUGAG X CGAA ICUUCUUC	1107	GAAGAAGC C CAAAGGAG	1831
304	ACUCCUUU CUGAUGAG X CGAA IGCUUCUU	1108	AAGAAGCC C AAAGGAGT	1832
305	AACUCCUU CUGAUGAG X CGAA IGGCUUCU	1109	AGAAGCCC A AAGGAGTT	1833
316	GGUAAGAA CUGAUGAG X CGAA IUAACUCC	1110	GGAGTTAC A TTCTTACC	1834
320	CCUGGGUA CUGAUGAG X CGAA IAAUGUAA	1111	TTACATTC T TACCCAGG	1835
324	GGGCCCUG CUGAUGAG X CGAA IUAAGAAU	1112	ATTCTTAC C CAGGGCCC	1836
325	AGGGCCCU CUGAUGAG X CGAA IGUAAGAA	1113	TTCTTACC C AGGGCCCT	1837
326	AAGGGCCC CUGAUGAG X CGAA IGGUAAGA	1114	TCTTACCC A GGGCCCTT	1838
331	AGGCAAAG CUGAUGAG X CGAA ICCCUGGG	1115	CCCAGGGC C CTTTGCCT	1839
332	UAGGCAAA CUGAUGAG X CGAA IGCCCUGG	1116	CCAGGGCC C TTTGCCTA	1840
333	UUAGGCAA CUGAUGAG X CGAA IGGCCCUG	1117	CAGGGCCC T TTGCCTAA	1841
338	AUGUGUUA CUGAUGAG X CGAA ICAAAGGG	1118	CCCTTTGC C TAACACAT	1842
339	CAUGUGUU CUGAUGAG X CGAA IGCAAAGG	1119	CCTTTGCC T AACACATG	1843
343	ACCGCAUG CUGAUGAG X CGAA IUUAGGCA	1120	TGCCTAAC A CATGCGGT	1844
345	UGACCGCA CUGAUGAG X CGAA IUGUUAGG	1121	CCTAACAC A TGCGGTCA	1845
353	CCCAAAAG CUGAUGAG X CGAA IACCGCAU	1122	ATGCGGTC A CTTTTGGG	1846
355	CUCCCAAA CUGAUGAG X CGAA IUGACCGC	1123	GCGGTCAC T TTTGGGAG	1847
377	UGCUUUUC CUGAUGAG X CGAA ICUCCCAC	1124	GTGGGAGC A GAAAAGCA	1848
385	GACACCCC CUGAUGAG X CGAA ICUUUUCU	1125	AGAAAAGC A GGGGTGTC	1849
397	GUUGAGCA CUGAUGAG X CGAA IACGACAC	1126	GTGTCGTC A TGCTCAAC	1850
401	CUCUGUUG CUGAUGAG X CGAA ICAUGACG	1127	CGTCATGC T CAACAGAG	1851
403	CACUCUGU CUGAUGAG X CGAA IAGCAUGA	1128	TCATGCTC A ACAGAGTG	1852
406	CAUCACUC CUGAUGAG X CGAA IUUGAGCA	1129	TGCTCAAC A GAGTGATG	1853
438	CAGUAUUG CUGAUGAG X CGAA ICGCAUUU	1130	AAATGCGC A CAATACTG	1854
440	GCCAGUAU CUGAUGAG X CGAA IUGCGCAU	1131	ATGCGCAC A ATACTGGC	1855
445	UUGUGGCC CUGAUGAG X CGAA IUAUUGUG	1132	CACAATAC T GGCCACAA	1856
449	CUUUUUGU CUGAUGAG X CGAA ICCAGUAU	1133	ATACTGGC C ACAAAAAG	1857
450	UCUUUUUG CUGAUGAG X CGAA IGCCAGUA	1134	TACTGGCC A CAAAAAGA	1858
452	CUUCUUUU CUGAUGAG X CGAA IUGGCCAG	1135	CTGGCCAC A AAAAGAAG	1859
475	GUCUUCAA CUGAUGAG X CGAA IAUCAUCU	1136	AGATGATC T TTGAAGAC	1860
484	CAAAUUUG CUGAUGAG X CGAA IUCUUCAA	1137	TTGAAGAC A CAAATTTG	1861
486	UUCAAAUU CUGAUGAG X CGAA IUGUCUUC	1138	GAAGACAC A AATTTGAA	1862
501	GAGAUCAA CUGAUGAG X CGAA IUUAAUUU	1139	AAATTAAC A TTGATCTC	1863
508	AUCUUCAG CUGAUGAG X CGAA IAUCAAUG	1140	CATTGATC T CTGAAGAT	1864
510	AUAUCUUC CUGAUGAG X CGAA IAGAUCAA	1141	TTGATCTC T GAAGATAT	1865
520	AUAUGACU CUGAUGAG X CGAA IAUAUCUU	1142	AAGATATC A AGTCATAT	1866
525	GUAUAAUA CUGAUGAG X CGAA IACUUGAU	1143	ATCAAGTC A TATTATAC	1867
534	UGUCGCAC CUGAUGAG X CGAA IUAUAAUA	1144	TATTATAC A GTGCGACA	1868
542	AUUCUAGC CUGAUGAG X CGAA IUCGCACU	1145	AGTGCGAC A GCTAGAAT	1869
545	CCAAUUCU CUGAUGAG X CGAA ICUGUCGC	1146	GCGACAGC T AGAATTGG	1870

Table 4

559	GGUUGUAA CUGAUGAG X CGAA IUUUUCCA	1147	TGGAAAAC C TTACAACC	1871
560	GGGUUGUA CUGAUGAG X CGAA IGUUUUCC	1148	GGAAAACC T TACAACCC	1872
564	UCUUGGGU CUGAUGAG X CGAA IUAAGGUU	1149	AACCTTAC A ACCCAAGA	1873
567	GUUUCUUG CUGAUGAG X CGAA IUUGUAAG	1150	CTTACAAC C CAAGAAAC	1874
568	AGUUUCUU CUGAUGAG X CGAA IGUUGUAA	1151	TTACAACC C AAGAAACT	1875
569	GAGUUUCU CUGAUGAG X CGAA IGGUUGUA	1152	TACAACCC A AGAAACTC	1876
576	AUCUCUCG CUGAUGAG X CGAA IUUUCUUG	1153	CAAGAAAC T CGAGAGAT	1877
586	GAAAUGUA CUGAUGAG X CGAA IAUCUCUC	1154	GAGAGATC T TACATTTC	1878
590	AGUGGAAA CUGAUGAG X CGAA IUAAGAUC	1155	GATCTTAC A TTTCCACT	1879
595	GGUAUAGU CUGAUGAG X CGAA IAAAUGUA	1156	TACATTTC C ACTATACC	1880
596	UGGUAUAG CUGAUGAG X CGAA IGAAAUGU	1157	ACATTTCC A CTATACCA	1881
598	UGUGGUAU CUGAUGAG X CGAA IUGGAAAU	1158	ATTTCCAC T ATACCACA	1882
603	GGCCAUGU CUGAUGAG X CGAA IUAUAGUG	1159	CACTATAC C ACATGGCC	1883
604	AGGCCAUG CUGAUGAG X CGAA IGUAUAGU	1160	ACTATACC A CATGGCCT	1884
606	UCAGGCCA CUGAUGAG X CGAA IUGGUAUA	1161	TATACCAC A TGGCCTGA	1885
611	CAAAGUCA CUGAUGAG X CGAA ICCAUGUG	1162	CACATGGC C TGACTTTG	1886
612	CCAAAGUC CUGAUGAG X CGAA IGCCAUGU	1163	ACATGGCC T GACTTTGG	1887
616	GACUCCAA CUGAUGAG X CGAA IUCAGGCC	1164	GGCCTGAC T TTGGAGTC	1888
625	UGAUUCAG CUGAUGAG X CGAA IACUCCAA	1165	TTGGAGTC C CTGAATCA	1889
626	GUGAUUCA CUGAUGAG X CGAA IGACUCCA	1166	TGGAGTCC C TGAATCAC	1890
627	GGUGAUUC CUGAUGAG X CGAA IGGACUCC	1167	GGAGTCCC T GAATCACC	1891
633	GAGGCUGG CUGAUGAG X CGAA IAUUCAGG	1168	CCTGAATC A CCAGCCTC	1892
635	AUGAGGCU CUGAUGAG X CGAA IUGAUUCA	1169	TGAATCAC C AGCCTCAT	1893
636	AAUGAGGC CUGAUGAG X CGAA IGUGAUUC	1170	GAATCACC A GCCTCATT	1894
639	AAGAAUGA CUGAUGAG X CGAA ICUGGUGA	1171	TCACCAGC C TCATTCTT	1895
640	CAAGAAUG CUGAUGAG X CGAA IGCUGGUG	1172	CACCAGCC T CATTCTTG	1896
642	UUCAAGAA CUGAUGAG X CGAA IAGGCUGG	1173	CCAGCCTC A TTCTTGAA	1897
646	AAAGUUCA CUGAUGAG X CGAA IAAUGAGG	1174	CCTCATTC T TGAACTTT	1898
652	GAAAAGAA CUGAUGAG X CGAA IUUCAAGA	1175	TCTTGAAC T TTCTTTTC	1899
656	CUUUGAAA CUGAUGAG X CGAA IAAAGUUC	1176	GAACTTTC T TTTCAAAG	1900
661	UCGGACUU CUGAUGAG X CGAA IAAAAGAA	1177	TTCTTTTC A AAGTCCGA	1901
667	UGACUCUC CUGAUGAG X CGAA IACUUUGA	1178	TCAAAGTC C GAGAGTCA	1902
675	AGUGACCC CUGAUGAG X CGAA IACUCUCG	1179	CGAGAGTC A GGGTCACT	1903
681	GGGCUGAG CUGAUGAG X CGAA IACCCUGA	1180	TCAGGGTC A CTCAGCCC	1904
683	CCGGGCUG CUGAUGAG X CGAA IUGACCCU	1181	AGGGTCAC T CAGCCCGG	1905
685	CUCCGGGC CUGAUGAG X CGAA IAGUGACC	1182	GGTCACTC A GCCCGGAG	1906
688	GUGCUCCG CUGAUGAG X CGAA ICUGAGUG	1183	CACTCAGC C CGGAGCAC	1907
689	CGUGCUCC CUGAUGAG X CGAA IGCUGAGU	1184	ACTCAGCC C GGAGCACG	1908
695	CGGGCCCG CUGAUGAG X CGAA ICUCCGGG	1185	CCCGGAGC A CGGGCCCG	1909
701	CCACAACG CUGAUGAG X CGAA ICCCGUGC	1186	GCACGGGC C CGTTGTGG	1910
702	ACCACAAC CUGAUGAG X CGAA IGCCCGUG	1187	CACGGGCC C GTTGTGGT	1911
713	CACUGCAG CUGAUGAG X CGAA ICACCACA	1188	TGTGGTGC A CTGCAGTG	1912
715	UGCACUGC CUGAUGAG X CGAA IUGCACCA	1189	TGGTGCAC T GCAGTGCA	1913
718	GCCUGCAC CUGAUGAG X CGAA ICAGUGCA	1190	TGCACTGC A GTGCAGGC	1914
723	CCGAUGCC CUGAUGAG X CGAA ICACUGCA	1191	TGCAGTGC A GGCATCGG	1915
727	CCUGCCGA CUGAUGAG X CGAA ICCUGCAC	1192	GTGCAGGC A TCGGCAGG	1916
733	UCCAGACC CUGAUGAG X CGAA ICCGAUGC	1193	GCATCGGC A GGTCTGGA	1917

Table 4

738	AAGGUUCC CUGAUGAG X CGAA IACCUGCC	1194	GGCAGGTC T GGAACCTT	1918
744	AGACAGAA CUGAUGAG X CGAA IUUCCAGA	1195	TCTGGAAC C TTCTGTCT	1919
745	CAGACAGA CUGAUGAG X CGAA IGUUCCAG	1196	CTGGAACC T TCTGTCTG	1920
748	AGCCAGAC CUGAUGAG X CGAA IAAGGUUC	1197	GAACCTTC T GTCTGGCT	1921
752	UAUCAGCC CUGAUGAG X CGAA IACAGAAG	1198	CTTCTGTC T GGCTGATA	1922
756	CAGGUAUC CUGAUGAG X CGAA ICCAGACA	1199	TGTCTGGC T GATACCTG	1923
762	AAGAGGCA CUGAUGAG X CGAA IUAUCAGC	1200	GCTGATAC C TGCCTCTT	1924
763	CAAGAGGC CUGAUGAG X CGAA IGUAUCAG	1201	CTGATACC T GCCTCTTG	1925
766	CAGCAAGA CUGAUGAG X CGAA ICAGGUAU	1202	ATACCTGC C TCTTGCTG	1926
767	UCAGCAAG CUGAUGAG X CGAA IGCAGGUA	1203	TACCTGCC T CTTGCTGA	1927
769	CAUCAGCA CUGAUGAG X CGAA IAGGCAGG	1204	CCTGCCTC T TGCTGATG	1928
773	UGUCCAUC CUGAUGAG X CGAA ICAAGAGG	1205	CCTCTTGC T GATGGACA	1929
781	UUUCCUCU CUGAUGAG X CGAA IUCCAUCA	1206	TGATGGAC A AGAGGAAA	1930
793	GGAAGAAG CUGAUGAG X CGAA IUCUUUCC	1207	GGAAAGAC C CTTCTTCC	1931
794	CGGAAGAA CUGAUGAG X CGAA IGUCUUUC	1208	GAAAGACC C TTCTTCCG	1932
795	ACGGAAGA CUGAUGAG X CGAA IGGUCUUU	1209	AAAGACCC T TCTTCCGT	1933
798	UCAACGGA CUGAUGAG X CGAA IAAGGGUC	1210	GACCCTTC T TCCGTTGA	1934
801	AUAUCAAC CUGAUGAG X CGAA IAAGAAGG	1211	CCTTCTTC C GTTGATAT	1935
811	CACUUUCU CUGAUGAG X CGAA IAUAUCAA	1212	TTGATATC A AGAAAGTG	1936
821	UUUCUAAC CUGAUGAG X CGAA ICACUUUC	1213	GAAAGTGC T GTTAGAAA	1937
851	UCUGGAUC CUGAUGAG X CGAA ICCCCAUC	1214	GATGGGGC T GATCCAGA	1938
856	GGCUGUCU CUGAUGAG X CGAA IAUCAGCC	1215	GGCTGATC C AGACAGCC	1939
857	CGGCUGUC CUGAUGAG X CGAA IGAUCAGC	1216	GCTGATCC A GACAGCCG	1940
861	UGGUCGGC CUGAUGAG X CGAA IUCUGGAU	1217	ATCCAGAC A GCCGACCA	1941
864	AGCUGGUC CUGAUGAG X CGAA ICUGUCUG	1218	CAGACAGC C GACCAGCT	1942
868	GCGCAGCU CUGAUGAG X CGAA IUCGGCUG	1219	CAGCCGAC C AGCTGCGC	1943
869	AGCGCAGC CUGAUGAG X CGAA IGUCGGCU	1220	AGCCGACC A GCTGCGCT	1944
872	AGAAGCGC CUGAUGAG X CGAA ICUGGUCG	1221	CGACCAGC T GCGCTTCT	1945
877	GUAGGAGA CUGAUGAG X CGAA ICGCAGCU	1222	AGCTGCGC T TCTCCTAC	1946
880	CAGGUAGG CUGAUGAG X CGAA IAAGCGCA	1223	TGCGCTTC T CCTACCTG	1947
882	GCCAGGUA CUGAUGAG X CGAA IAGAAGCG	1224	CGCTTCTC C TACCTGGC	1948
883	AGCCAGGU CUGAUGAG X CGAA IGAGAAGC	1225	GCTTCTCC T ACCTGGCT	1949
886	CACAGCCA CUGAUGAG X CGAA IUAGGAGA	1226	TCTCCTAC C TGGCTGTG	1950
887	UCACAGCC CUGAUGAG X CGAA IGUAGGAG	1227	CTCCTACC T GGCTGTGA	1951
891	UCGAUCAC CUGAUGAG X CGAA ICCAGGUA	1228	TACCTGGC T GTGATCGA	1952
906	AUGAAUUU CUGAUGAG X CGAA ICACCUUC	1229	GAAGGTGC C AAATTCAT	1953
907	GAUGAAUU CUGAUGAG X CGAA IGCACCUU	1230	AAGGTGCC A AATTCATC	1954
913	CCCCAUGA CUGAUGAG X CGAA IAAUUUGG	1231	CCAAATTC A TCATGGGG	1955
916	GUCCCCCA CUGAUGAG X CGAA IAUGAAUU	1232	AATTCATC A TGGGGGAC	1956
925	CACGGAAG CUGAUGAG X CGAA IUCCCCCA	1233	TGGGGGAC T CTTCCGTG	1957
927	UGCACGGA CUGAUGAG X CGAA IAGUCCCC	1234	GGGGACTC T TCCGTGCA	1958
930	UCCUGCAC CUGAUGAG X CGAA IAAGAGUC	1235	GACTCTTC C GTGCAGGA	1959
935	ACUGAUCC CUGAUGAG X CGAA ICACGGAA	1236	TTCCGTGC A GGATCAGT	1960
941	CCUUCCAC CUGAUGAG X CGAA IAUCCUGC	1237	GCAGGATC A GTGGAAGG	1961
953	CGUGGGAA CUGAUGAG X CGAA ICUCCUUC	1238	GAAGGAGC T TTCCCACG	1962
957	UCCUCGUG CUGAUGAG X CGAA IAAAGCUC	1239	GAGCTTTC C CACGAGGA	1963
958	GUCCUCGU CUGAUGAG X CGAA IGAAAGCU	1240	AGCTTTCC C ACGAGGAC	1964

Table 4

959	GGUCCUCG CUGAUGAG X CGAA IGGAAAGC	1241	GCTTTCCC A CGAGGACC	1965
967	GGGCUCCA CUGAUGAG X CGAA IUCCUCGU	1242	ACGAGGAC C TGGAGCCC	1966
968	GGGGCUCC CUGAUGAG X CGAA IGUCCUCG	1243	CGAGGACC T GGAGCCCC	1967
974	CGGGUGGG CUGAUGAG X CGAA ICUCCAGG	1244	CCTGGAGC C CCCACCCG	1968
975	UCGGGUGG CUGAUGAG X CGAA IGCUCCAG	1245	CTGGAGCC C CCACCCGA	1969
976	CUCGGGUG CUGAUGAG X CGAA IGGCUCCA	1246	TGGAGCCC C CACCCGAG	1970
977	GCUCGGGU CUGAUGAG X CGAA IGGGCUCC	1247	GGAGCCCC C ACCCGAGC	1971
978	UGCUCGGG CUGAUGAG X CGAA IGGGGCUC	1248	GAGCCCCC A CCCGAGCA	1972
980	UAUGCUCG CUGAUGAG X CGAA IUGGGGGC	1249	GCCCCCAC C CGAGCATA	1973
981	AUAUGCUC CUGAUGAG X CGAA IGUGGGGG	1250	CCCCCACC C GAGCATAT	1974
986	GGGGGAUA CUGAUGAG X CGAA ICUCGGGU	1251	ACCCGAGC A TATCCCCC	1975
991	AGGUGGGG CUGAUGAG X CGAA IAUAUGCU	1252	AGCATATC C CCCCACCT	1976
992	GAGGUGGG CUGAUGAG X CGAA IGAUAUGC	1253	GCATATCC C CCCACCTC	1977
993	GGAGGUGG CUGAUGAG X CGAA IGGAUAUG	1254	CATATCCC C CCACCTCC	1978
994	GGGAGGUG CUGAUGAG X CGAA IGGGAUAU	1255	ATATCCCC C CACCTCCC	1979
995	GGGGAGGU CUGAUGAG X CGAA IGGGGAUA	1256	TATCCCCC C ACCTCCCC	1980
996	CGGGGAGG CUGAUGAG X CGAA IGGGGGAU	1257	ATCCCCCC A CCTCCCCG	1981
998	GCCGGGGA CUGAUGAG X CGAA IUGGGGGG	1258	CCCCCCAC C TCCCCGGC	1982
999	GGCCGGGG CUGAUGAG X CGAA IGUGGGGG	1259	CCCCCACC T CCCCGGCC	1983
1001	GUGGCCGG CUGAUGAG X CGAA IAGGUGGG	1260	CCCACCTC C CCGGCCAC	1984
1002	GGUGGCCG CUGAUGAG X CGAA IGAGGUGG	1261	CCACCTCC C CGGCCACC	1985
1003	GGGUGGCC CUGAUGAG X CGAA IGGAGGUG	1262	CACCTCCC C GGCCACCC	1986
1007	GUUUGGGU CUGAUGAG X CGAA ICCGGGGA	1263	TCCCCGGC C ACCCAAAC	1987
1008	CGUUUGGG CUGAUGAG X CGAA IGCCGGGG	1264	CCCCGGCC A CCCAAACG	1988
1010	UUCGUUUG CUGAUGAG X CGAA IUGGCCGG	1265	CCGGCCAC C CAAACGAA	1989
1011	AUUCGUUU CUGAUGAG X CGAA IGUGGCCG	1266	CGGCCACC C AAACGAAT	1990
1012	GAUUCGUU CUGAUGAG X CGAA IGGUGGCC	1267	GGCCACCC A AACGAATC	1991
1021	UGGCUCCA CUGAUGAG X CGAA IAUUCGUU	1268	AACGAATC C TGGAGCCA	1992
1022	GUGGCUCC CUGAUGAG X CGAA IGAUUCGU	1269	ACGAATCC T GGAGCCAC	1993
1028	CAUUGUGU CUGAUGAG X CGAA ICUCCAGG	1270	CCTGGAGC C ACACAATG	1994
1029	CCAUUGUG CUGAUGAG X CGAA IGCUCCAG	1271	CTGGAGCC A CACAATGG	1995
1031	UCCCAUUG CUGAUGAG X CGAA IUGGCUCC	1272	GGAGCCAC A CAATGGGA	1996
1033	UUUCCCAU CUGAUGAG X CGAA IUGUGGCU	1273	AGCCACAC A ATGGGAAA	1997
1045	GAACUCCC CUGAUGAG X CGAA ICAUUUCC	1274	GGAAATGC A GGGAGTTC	1998
1054	AUUUGGGA CUGAUGAG X CGAA IAACUCCC	1275	GGGAGTTC T TCCCAAAT	1999
1057	GUGAUUUG CUGAUGAG X CGAA IAAGAACU	1276	AGTTCTTC C CAAATCAC	2000
1058	GGUGAUUU CUGAUGAG X CGAA IGAAGAAC	1277	GTTCTTCC C AAATCACC	2001
1059	UGGUGAUU CUGAUGAG X CGAA IGGAAGAA	1278	TTCTTCCC A AATCACCA	2002
1064	CCCACUGG CUGAUGAG X CGAA IAUUUGGG	1279	CCCAAATC A CCAGTGGG	2003
1066	CACCCACU CUGAUGAG X CGAA IUGAUUUG	1280	CAAATCAC C AGTGGGTG	2004
1067	UCACCCAC CUGAUGAG X CGAA IGUGAUUU	1281	AAATCACC A GTGGGTGA	2005
1086	UCCUCCUG CUGAUGAG X CGAA IUCUCUUC	1282	GAAGAGAC C CAGGAGGA	2006
1087	AUCCUCCU CUGAUGAG X CGAA IGUCUCUU	1283	AAGAGACC C AGGAGGAT	2007
1088	UAUCCUCC CUGAUGAG X CGAA IGGUCUCU	1284	AGAGACCC A GGAGGATA	2008
1102	GAUGGGGC CUGAUGAG X CGAA IUCUUUAU	1285	ATAAAGAC T GCCCCATC	2009
1105	CUUGAUGG CUGAUGAG X CGAA ICAGUCUU	1286	AAGACTGC C CCATCAAG	2010
1106	CCUUGAUG CUGAUGAG X CGAA IGCAGUCU	1287	AGACTGCC C CATCAAGG	2011

Table 4

1107	UCCUUGAU CUGAUGAG X CGAA IGGCAGUC	1288	GACTGCCC C ATCAAGGA	2012
1108	UUCCUUGA CUGAUGAG X CGAA IGGGCAGU	1289	ACTGCCCC A TCAAGGAA	2013
1111	UUCUUCCU CUGAUGAG X CGAA IAUGGGGC	1290	GCCCCATC A AGGAAGAA	2014
1129	AUUUAAGG CUGAUGAG X CGAA ICUUCCUU	1291	AAGGAAGC C CCTTAAAT	2015
1130	CAUUUAAG CUGAUGAG X CGAA IGCUUCCU	1292	AGGAAGCC C CTTAAATG	2016
1131	GCAUUUAA CUGAUGAG X CGAA IGGCUUCC	1293	GGAAGCCC C TTAAATGC	2017
1132	GGCAUUUA CUGAUGAG X CGAA IGGGCUUC	1294	GAAGCCCC T TAAATGCC	2018
1140	UAGGGUGC CUGAUGAG X CGAA ICAUUUAA	1295	TTAAATGC C GCACCCTA	2019
1143	CCGUAGGG CUGAUGAG X CGAA ICGGCAUU	1296	AATGCCGC A CCCTACGG	2020
1145	UGCCGUAG CUGAUGAG X CGAA IUGCGGCA	1297	TGCCGCAC C CTACGGCA	2021
1146	AUGCCGUA CUGAUGAG X CGAA IGUGCGGC	1298	GCCGCACC C TACGGCAT	2022
1147	GAUGCCGU CUGAUGAG X CGAA IGGUGCGG	1299	CCGCACCC T ACGGCATC	2023
1153	GCUUUCGA CUGAUGAG X CGAA ICCGUAGG	1300	CCTACGGC A TCGAAAGC	2024
1162	UUGACUCA CUGAUGAG X CGAA ICUUUCGA	1301	TCGAAAGC A TGAGTCAA	2025
1169	CAGUGUCU CUGAUGAG X CGAA IACUCAUG	1302	CATGAGTC A AGACACTG	2026
1174	AACUUCAG CUGAUGAG X CGAA IUCUUGAC	1303	GTCAAGAC A CTGAAGTT	2027
1176	CUAACUUC CUGAUGAG X CGAA IUGUCUUG	1304	CAAGACAC T GAAGTTAG	2028
1208	CACCUCGA CUGAUGAG X CGAA IACUUCCC	1305	GGGAAGTC T TCGAGGTG	2029
1218	GCAGCCUG CUGAUGAG X CGAA ICACCUCG	1306	CGAGGTGC C CAGGCTGC	2030
1219	GGCAGCCU CUGAUGAG X CGAA IGCACCUC	1307	GAGGTGCC C AGGCTGCC	2031
1220	AGGCAGCC CUGAUGAG X CGAA IGGCACCU	1308	AGGTGCCC A GGCTGCCT	2032
1224	GGGGAGGC CUGAUGAG X CGAA ICCUGGGC	1309	GCCCAGGC T GCCTCCCC	2033
1227	GCUGGGGA CUGAUGAG X CGAA ICAGCCUG	1310	CAGGCTGC C TCCCCAGC	2034
1228	GGCUGGGG CUGAUGAG X CGAA IGCAGCCU	1311	AGGCTGCC T CCCCAGCC	2035
1230	UUGGCUGG CUGAUGAG X CGAA IAGGCAGC	1312	GCTGCCTC C CCAGCCAA	2036
1231	UUUGGCUG CUGAUGAG X CGAA IGAGGCAG	1313	CTGCCTCC C CAGCCAAA	2037
1232	CUUUGGCU CUGAUGAG X CGAA IGGAGGCA	1314	TGCCTCCC C AGCCAAAG	2038
1233	CCUUUGGC CUGAUGAG X CGAA IGGGAGGC	1315	GCCTCCCC A GCCAAAGG	2039
1236	UCCCCUUU CUGAUGAG X CGAA ICUGGGGA	1316	TCCCCAGC C AAAGGGGA	2040
1237	CUCCCCUU CUGAUGAG X CGAA IGCUGGGG	1317	CCCCAGCC A AAGGGGAG	2041
1247	GCAGUGAC CUGAUGAG X CGAA ICUCCCCU	1318	AGGGGAGC C GTCACTGC	2042
1251	UCGGGCAG CUGAUGAG X CGAA IACGGCUC	1319	GAGCCGTC A CTGCCCGA	2043
1253	UCUCGGGC CUGAUGAG X CGAA IUGACGGC	1320	GCCGTCAC T GCCCGAGA	2044
1256	CCUUCUCG CUGAUGAG X CGAA ICAGUGAC	1321	GTCACTGC C CGAGAAGG	2045
1257	UCCUUCUC CUGAUGAG X CGAA IGCAGUGA	1322	TCACTGCC C GAGAAGGA	2046
1273	CAGUGCAU CUGAUGAG X CGAA IUCCUCGU	1323	ACGAGGAC C ATGCACTG	2047
1274	UCAGUGCA CUGAUGAG X CGAA IGUCCUCG	1324	CGAGGACC A TGCACTGA	2048
1278	UAACUCAG CUGAUGAG X CGAA ICAUGGUC	1325	GACCATGC A CTGAGTTA	2049
1280	AGUAACUC CUGAUGAG X CGAA IUGCAUGG	1326	CCATGCAC T GAGTTACT	2050
1288	GGGCUUCC CUGAUGAG X CGAA IUAACUCA	1327	TGAGTTAC T GGAAGCCC	2051
1295	CCAGGAAG CUGAUGAG X CGAA ICUUCCAG	1328	CTGGAAGC C CTTCCTGG	2052
1296	ACCAGGAA CUGAUGAG X CGAA IGCUUCCA	1329	TGGAAGCC C TTCCTGGT	2053
1297	GACCAGGA CUGAUGAG X CGAA IGGCUUCC	1330	GGAAGCCC T TCCTGGTC	2054
1300	GUUGACCA CUGAUGAG X CGAA IAAGGGCU	1331	AGCCCTTC C TGGTCAAC	2055
1301	UGUUGACC CUGAUGAG X CGAA IGAAGGGC	1332	GCCCTTCC T GGTCAACA	2056
1306	GCACAUGU CUGAUGAG X CGAA IACCAGGA	1333	TCCTGGTC A ACATGTGC	2057
1309	CACGCACA CUGAUGAG X CGAA IUUGACCA	1334	TGGTCAAC A TGTGCGTG	2058

Table 4

1320	AGGACCGU CUGAUGAG X CGAA ICCACGCA	1335	TGCGTGGC T ACGGTCCT	2059
1327	GGCCGUGA CUGAUGAG X CGAA IACCGUAG	1336	CTACGGTC C TCACGGCC	2060
1328	CGGCCGUG CUGAUGAG X CGAA IGACCGUA	1337	TACGGTCC T CACGGCCG	2061
1330	GCCGGCCG CUGAUGAG X CGAA IAGGACCG	1338	CGGTCCTC A CGGCCGGC	2062
1335	UAAGCGCC CUGAUGAG X CGAA ICCGUGAG	1339	CTCACGGC C GGCGCTTA	2063
1341	CAGAGGUA CUGAUGAG X CGAA ICGCCGGC	1340	GCCGGCGC T TACCTCTG	2064
1345	GUAGCAGA CUGAUGAG X CGAA IUAAGCGC	1341	GCGCTTAC C TCTGCTAC	2065
1346	UGUAGCAG CUGAUGAG X CGAA IGUAAGCG	1342	CGCTTACC T CTGCTACA	2066
1348	CCUGUAGC CUGAUGAG X CGAA IAGGUAAG	1343	CTTACCTC T GCTACAGG	2067
1351	GAACCUGU CUGAUGAG X CGAA ICAGAGGU	1344	ACCTCTGC T ACAGGTTC	2068
1354	CAGGAACC CUGAUGAG X CGAA IUAGCAGA	1345	TCTGCTAC A GGTTCCTG	2069
1360	GUUGAACA CUGAUGAG X CGAA IAACCUGU	1346	ACAGGTTC C TGTTCAAC	2070
1361	UGUUGAAC CUGAUGAG X CGAA IGAACCUG	1347	CAGGTTCC T GTTCAACA	2071
1366	GUUGCUGU CUGAUGAG X CGAA IAACAGGA	1348	TCCTGTTC A ACAGCAAC	2072
1369	UGUGUUGC CUGAUGAG X CGAA IUUGAACA	1349	TGTTCAAC A GCAACACA	2073
1372	CUAUGUGU CUGAUGAG X CGAA ICUGUUGA	1350	TCAACAGC A ACACATAG	2074
1375	AGGCUAUG CUGAUGAG X CGAA IUUGCUGU	1351	ACAGCAAC A CATAGCCT	2075
1377	UCAGGCUA CUGAUGAG X CGAA IUGUUGCU	1352	AGCAACAC A TAGCCTGA	2076
1382	GAGGGUCA CUGAUGAG X CGAA ICUAUGUG	1353	CACATAGC C TGACCCTC	2077
1383	GGAGGGUC CUGAUGAG X CGAA IGCUAUGU	1354	ACATAGCC T GACCCTCC	2078
1387	UGGAGGAG CUGAUGAG X CGAA IUCAGGCU	1355	AGCCTGAC C CTCCTCCA	2079
1388	GUGGAGGA CUGAUGAG X CGAA IGUCAGGC	1356	GCCTGACC C TCCTCCAC	2080
1389	AGUGGAGG CUGAUGAG X CGAA IGGUCAGG	1357	CCTGACCC T CCTCCACT	2081
1391	GGAGUGGA CUGAUGAG X CGAA IAGGGUCA	1358	TGACCCTC C TCCACTCC	2082
1392	UGGAGUGG CUGAUGAG X CGAA IGAGGGUC	1359	GACCCTCC T CCACTCCA	2083
1394	GGUGGAGU CUGAUGAG X CGAA IAGGAGGG	1360	CCCTCCTC C ACTCCACC	2084
1395	AGGUGGAG CUGAUGAG X CGAA IGAGGAGG	1361	CCTCCTCC A CTCCACCT	2085
1397	GGAGGUGG CUGAUGAG X CGAA IUGGAGGA	1362	TCCTCCAC T CCACCTCC	2086
1399	GUGGAGGU CUGAUGAG X CGAA IAGUGGAG	1363	CTCCACTC C ACCTCCAC	2087
1400	GGUGGAGG CUGAUGAG X CGAA IGAGUGGA	1364	TCCACTCC A CCTCCACC	2088
1402	UGGGUGGA CUGAUGAG X CGAA IUGGAGUG	1365	CACTCCAC C TCCACCCA	2089
1403	GUGGGUGG CUGAUGAG X CGAA IGUGGAGU	1366	ACTCCACC T CCACCCAC	2090
1405	CAGUGGGU CUGAUGAG X CGAA IAGGUGGA	1367	TCCACCTC C ACCCACTG	2091
1406	ACAGUGGG CUGAUGAG X CGAA IGAGGUGG	1368	CCACCTCC A CCCACTGT	2092
1408	GGACAGUG CUGAUGAG X CGAA IUGGAGGU	1369	ACCTCCAC C CACTGTCC	2093
1409	CGGACAGU CUGAUGAG X CGAA IGUGGAGG	1370	CCTCCACC C ACTGTCCG	2094
1410	GCGGACAG CUGAUGAG X CGAA IGGUGGAG	1371	CTCCACCC A CTGTCCGC	2095
1412	AGGCGGAC CUGAUGAG X CGAA IUGGGUGG	1372	CCACCCAC T GTCCGCCT	2096
1416	GCAGAGGC CUGAUGAG X CGAA IACAGUGG	1373	CCACTGTC C GCCTCTGC	2097
1419	CGGGCAGA CUGAUGAG X CGAA ICGGACAG	1374	CTGTCCGC C TCTGCCCG	2098
1420	GCGGGCAG CUGAUGAG X CGAA IGCGGACA	1375	TGTCCGCC T CTGCCCGC	2099
1422	CUGCGGGC CUGAUGAG X CGAA IAGGCGGA	1376	TCCGCCTC T GCCCGCAG	2100
1425	GCUCUGCG CUGAUGAG X CGAA ICAGAGGC	1377	GCCTCTGC C CGCAGAGC	2101
1426	GGCUCUGC CUGAUGAG X CGAA IGCAGAGG	1378	CCTCTGCC C GCAGAGCC	2102
1429	GUGGGCUC CUGAUGAG X CGAA ICGGGCAG	1379	CTGCCCGC A GAGCCCAC	2103
1434	CGGGCGUG CUGAUGAG X CGAA ICUCUGCG	1380	CGCAGAGC C CACGCCCG	2104
1435	UCGGGCGU CUGAUGAG X CGAA IGCUCUGC	1381	GCAGAGCC C ACGCCCGA	2105

Table 4

1436	GUCGGGCG CUGAUGAG X CGAA IGGCUCUG	1382	CAGAGCCC A CGCCCGAC	2106
1440	GCUAGUCG CUGAUGAG X CGAA ICGUGGGC	1383	GCCCACGC C CGACTAGC	2107
1441	UGCUAGUC CUGAUGAG X CGAA IGCGUGGG	1384	CCCACGCC C GACTAGCA	2108
1445	UGCCUGCU CUGAUGAG X CGAA IUCGGGCG	1385	CGCCCGAC T AGCAGGCA	2109
1449	GGCAUGCC CUGAUGAG X CGAA ICUAGUCG	1386	CGACTAGC A GGCATGCC	2110
1453	CCGCGGCA CUGAUGAG X CGAA ICCUGCUA	1387	TAGCAGGC A TGCCGCGG	2111
1457	CCUACCGC CUGAUGAG X CGAA ICAUGCCU	1388	AGGCATGC C GCGGTAGG	2112
1473	GGUCCGGC CUGAUGAG X CGAA ICCCUUAC	1389	GTAAGGGC C GCCGGACC	2113
1476	CGCGGUCC CUGAUGAG X CGAA ICGGCCCU	1390	AGGGCCGC C GGACCGCG	2114
1481	CUCUACGC CUGAUGAG X CGAA IUCCGGCG	1391	CGCCGGAC C GCGTAGAG	2115
1493	CGGGGCCC CUGAUGAG X CGAA ICUCUCUA	1392	TAGAGAGC C GGGCCCCG	2116
1498	CCGUCCGG CUGAUGAG X CGAA ICCCGGCU	1393	AGCCGGGC C CCGGACGG	2117
1499	UCCGUCCG CUGAUGAG X CGAA IGCCCGGC	1394	GCCGGGCC C CGGACGGA	2118
1500	GUCCGUCC CUGAUGAG X CGAA IGGCCCGG	1395	CCGGGCCC C GGACGGAC	2119
1517	UUUAGUGC CUGAUGAG X CGAA IAACCAAC	1396	GTTGGTTC T GCACTAAA	2120
1520	GGUUUUAG CUGAUGAG X CGAA ICAGAACC	1397	GGTTCTGC A CTAAAACC	2121
1522	UGGGUUUU CUGAUGAG X CGAA IUGCAGAA	1398	TTCTGCAC T AAAACCCA	2122
1528	GGAAGAUG CUGAUGAG X CGAA IUUUUAGU	1399	ACTAAAAC C CATCTTCC	2123
1529	GGGAAGAU CUGAUGAG X CGAA IGUUUUAG	1400	CTAAAACC C ATCTTCCC	2124
1530	GGGGAAGA CUGAUGAG X CGAA IGGUUUUA	1401	TAAAACCC A TCTTCCCC	2125
1533	UCCGGGGA CUGAUGAG X CGAA IAUGGGUU	1402	AACCCATC T TCCCCGGA	2126
1536	ACAUCCGG CUGAUGAG X CGAA IAAGAUGG	1403	CCATCTTC C CCGGATGT	2127
1537	CACAUCCG CUGAUGAG X CGAA IGAAGAUG	1404	CATCTTCC C CGGATGTG	2128
1538	ACACAUCC CUGAUGAG X CGAA IGGAAGAU	1405	ATCTTCCC C GGATGTGT	2129
1550	GAGGGGUG CUGAUGAG X CGAA IACACACA	1406	TGTGTGTC T CACCCCTC	2130
1552	AUGAGGGG CUGAUGAG X CGAA IAGACACA	1407	TGTGTCTC A CCCCTCAT	2131
1554	GGAUGAGG CUGAUGAG X CGAA IUGAGACA	1408	TGTCTCAC C CCTCATCC	2132
1555	AGGAUGAG CUGAUGAG X CGAA IGUGAGAC	1409	GTCTCACC C CTCATCCT	2133
1556	AAGGAUGA CUGAUGAG X CGAA IGGUGAGA	1410	TCTCACCC C TCATCCTT	2134
1557	AAAGGAUG CUGAUGAG X CGAA IGGGUGAG	1411	CTCACCCC T CATCCTTT	2135
1559	UAAAAGGA CUGAUGAG X CGAA IAGGGGUG	1412	CACCCCTC A TCCTTTTA	2136
1562	AAGUAAAA CUGAUGAG X CGAA IAUGAGGG	1413	CCCTCATC C TTTTACTT	2137
1563	AAAGUAAA CUGAUGAG X CGAA IGAUGAGG	1414	CCTCATCC T TTTACTTT	2138
1569	GGGCAAAA CUGAUGAG X CGAA IUAAAAGG	1415	CCTTTTAC T TTTGCCC	2139
1576	GUGGAAGG CUGAUGAG X CGAA ICAAAAAG	1416	CTTTTTGC C CCTTCCAC	2140
1577	AGUGGAAG CUGAUGAG X CGAA IGCAAAAA	1417	TTTTTGCC C CTTCCACT	2141
1578	AAGUGGAA CUGAUGAG X CGAA IGGCAAAA	1418	TTTTGCCC C TTCCACTT	2142
1579	AAAGUGGA CUGAUGAG X CGAA IGGGCAAA	1419	TTTGCCCC T TCCACTTT	2143
1582	CUCAAAGU CUGAUGAG X CGAA IAAGGGGC	1420	GCCCCTTC C ACTTTGAG	2144
1583	ACUCAAAG CUGAUGAG X CGAA IGAAGGGG	1421	CCCCTTCC A CTTTGAGT	2145
1585	GUACUCAA CUGAUGAG X CGAA IUGGAAGG	1422	CCTTCCAC T TTGAGTAC	2146
1594	GUGGAUUU CUGAUGAG X CGAA IUACUCAA	1423	TTGAGTAC C AAATCCAC	2147
1595	UGUGGAUU CUGAUGAG X CGAA IGUACUCA	1424	TGAGTACC A AATCCACA	2148
1600	UGGCUUGU CUGAUGAG X CGAA IAUUUGGU	1425	ACCAAATC C ACAAGCCA	2149
1601	AUGGCUUG CUGAUGAG X CGAA IGAUUUGG	1426	CCAAATCC A CAAGCCAT	2150
1603	AAAUGGCU CUGAUGAG X CGAA IUGGAUUU	1427	AAATCCAC A AGCCATTT	2151
1607	CAAAAAAU CUGAUGAG X CGAA ICUUGUGG	1428	CCACAAGC C ATTTTTTG	2152

Table 4

1608	UCAAAAAA CUGAUGAG X CGAA IGCUUGUG	1429	CACAAGCC A TTTTTTGA	2153
1636	GCCAGCAU CUGAUGAG X CGAA IUACUCUC	1430	GAGAGTAC C ATGCTGGC	2154
1637	CGCCAGCA CUGAUGAG X CGAA IGUACUCU	1431	AGAGTACC A TGCTGGCG	2155
1641	GCGCCGCC CUGAUGAG X CGAA ICAUGGUA	1432	TACCATGC T GGCGGCGC	2156
1650	CUUCCCUC CUGAUGAG X CGAA ICGCCGCC	1433	GGCGGCGC A GAGGGAAG	2157
1663	CGGGUGUA CUGAUGAG X CGAA ICCCCUUC	1434	GAAGGGGC C TACACCCG	2158
1664	ACGGGUGU CUGAUGAG X CGAA IGCCCCUU	1435	AAGGGGCC T ACACCCGT	2159
1667	AAGACGGG CUGAUGAG X CGAA IUAGGCCC	1436	GGGCCTAC A CCCGTCTT	2160
1669	CCAAGACG CUGAUGAG X CGAA IUGUAGGC	1437	GCCTACAC C CGTCTTGG	2161
1670	CCCAAGAC CUGAUGAG X CGAA IGUGUAGG	1438	CCTACACC C GTCTTGGG	2162
1674	GAGCCCCA CUGAUGAG X CGAA IACGGGUG	1439	CACCCGTC T TGGGGCTC	2163
1681	GUGGGGCG CUGAUGAG X CGAA ICCCCAAG	1440	CTTGGGGC T CGCCCCAC	2164
1685	CUGGGUGG CUGAUGAG X CGAA ICGAGCCC	1441	GGGCTCGC C CCACCCAG	2165
1686	CCUGGGUG CUGAUGAG X CGAA IGCGAGCC	1442	GGCTCGCC C CACCCAGG	2166
1687	CCCUGGGU CUGAUGAG X CGAA IGGCGAGC	1443	GCTCGCCC C ACCCAGGG	2167
1688	GCCCUGGG CUGAUGAG X CGAA IGGGCGAG	1444	CTCGCCCC A CCCAGGGC	2168
1690	GAGCCCUG CUGAUGAG X CGAA IUGGGGCG	1445	CGCCCCAC C CAGGGCTC	2169
1691	GGAGCCCU CUGAUGAG X CGAA IGUGGGGC	1446	GCCCCACC C AGGGCTCC	2170
1692	GGGAGCCC CUGAUGAG X CGAA IGGUGGGG	1447	CCCCACCC A GGGCTCCC	2171
1697	CAGGAGGG CUGAUGAG X CGAA ICCCUGGG	1448	CCCAGGGC T CCCTCCTG	2172
1699	UCCAGGAG CUGAUGAG X CGAA IAGCCCUG	1449	CAGGGCTC C CTCCTGGA	2173
1700	CUCCAGGA CUGAUGAG X CGAA IGAGCCCU	1450	AGGGCTCC C TCCTGGAG	2174
1701	GCUCCAGG CUGAUGAG X CGAA IGGAGCCC	1451	GGGCTCCC T CCTGGAGC	2175
1703	AUGCUCCA CUGAUGAG X CGAA IAGGGAGC	1452	GCTCCCTC C TGGAGCAT	2176
1704	GAUGCUCC CUGAUGAG X CGAA IGAGGGAG	1453	CTCCCTCC T GGAGCATC	2177
1710	GCCUGGGA CUGAUGAG X CGAA ICUCCAGG	1454	CCTGGAGC A TCCCAGGC	2178
1713	CCCGCCUG CUGAUGAG X CGAA IAUGCUCC	1455	GGAGCATC C CAGGCGGG	2179
1714	GCCCGCCU CUGAUGAG X CGAA IGAUGCUC	1456	GAGCATCC C AGGCGGGC	2180
1715	CGCCCGCC CUGAUGAG X CGAA IGGAUGCU	1457	AGCATCCC A GGCGGGCG	2181
1726	GUCUGGCG CUGAUGAG X CGAA ICCGCCCG	1458	CGGGCGGC A CGCCAGAC	2182
1730	GGCUGUCU CUGAUGAG X CGAA ICGUGCCG	1459	CGGCACGC C AGACAGCC	2183
1731	GGGCUGUC CUGAUGAG X CGAA IGCGUGCC	1460	GGCACGCC A GACAGCCC	2184
1735	GGGGGGGC CUGAUGAG X CGAA IUCUGGCG	1461	CGCCAGAC A GCCCCCCC	2185
1738	AAGGGGGG CUGAUGAG X CGAA ICUGUCUG	1462	CAGACAGC C CCCCCCTT	2186
1739	CAAGGGGG CUGAUGAG X CGAA IGCUGUCU	1463	AGACAGCC C CCCCCTTG	2187
1740	UCAAGGGG CUGAUGAG X CGAA IGGCUGUC	1464	GACAGCCC C CCCCTTGA	2188
1741	UUCAAGGG CUGAUGAG X CGAA IGGGCUGU	1465	ACAGCCCC C CCCTTGAA	2189
1742	AUUCAAGG CUGAUGAG X CGAA IGGGGCUG	1466	CAGCCCCC C CCTTGAAT	2190
1743	GAUUCAAG CUGAUGAG X CGAA IGGGGGCU	1467	AGCCCCCC C CTTGAATC	2191
1744	AGAUUCAA CUGAUGAG X CGAA IGGGGGGC	1468	GCCCCCCC C TTGAATCT	2192
1745	CAGAUUCA CUGAUGAG X CGAA IGGGGGGG	1469	CCCCCCCC T TGAATCTG	2193
1752	CUCCCUGC CUGAUGAG X CGAA IAUUCAAG	1470	CTTGAATC T GCAGGGAG	2194
1755	UUGCUCCC CUGAUGAG X CGAA ICAGAUUC	1471	GAATCTGC A GGGAGCAA	2195
1762	UGGAGAGU CUGAUGAG X CGAA ICUCCCUG	1472	CAGGGAGC A ACTCTCCA	2196
1765	GAGUGGAG CUGAUGAG X CGAA IUUGCUCC	1473	GGAGCAAC T CTCCACTC	2197
1767	UGGAGUGG CUGAUGAG X CGAA IAGUUGCU	1474	AGCAACTC T CCACTCCA	2198
1769	UAUGGAGU CUGAUGAG X CGAA IAGAGUUG	1475	CAACTCTC C ACTCCATA	2199

Table 4

1770	AUAUGGAG CUGAUGAG X CGAA IGAGAGUU	1476	AACTCTCC A CTCCATAT	2200
1772	AAAUAUGG CUGAUGAG X CGAA IUGGAGAG	1477	CTCTCCAC T CCATATTT	2201
1774	AUAAAUAU CUGAUGAG X CGAA IAGUGGAG	1478	CTCCACTC C ATATTTAT	2202
1775	AAUAAAUA CUGAUGAG X CGAA IGAGUGGA	1479	TCCACTCC A TATTTATT	2203
1789	GAAAAAAU CUGAUGAG X CGAA IUUUAAAU	1480	ATTTAAAC A ATTTTTTC	2204
1798	GCCUUUGG CUGAUGAG X CGAA IAAAAAAU	1481	ATTTTTTC C CCAAAGGC	2205
1799	UGCCUUUG CUGAUGAG X CGAA IGAAAAAA	1482	TTTTTTCC C CAAAGGCA	2206
1800	AUGCCUUU CUGAUGAG X CGAA IGGAAAAA	1483	TTTTTCCC C AAAGGCAT	2207
1801	GAUGCCUU CUGAUGAG X CGAA IGGGAAAA	1484	TTTTCCCC A AAGGCATC	2208
1807	ACUAUGGA CUGAUGAG X CGAA ICCUUUGG	1485	CCAAAGGC A TCCATAGT	2209
1810	UGCACUAU CUGAUGAG X CGAA IAUGCCUU	1486	AAGGCATC C ATAGTGCA	2210
1811	GUGCACUA CUGAUGAG X CGAA IGAUGCCU	1487	AGGCATCC A TAGTGCAC	2211
1818	AAUGCUAG CUGAUGAG X CGAA ICACUAUG	1488	CATAGTGC A CTAGCATT	2212
1820	AAAAUGCU CUGAUGAG X CGAA IUGCACUA	1489	TAGTGCAC T AGCATTTT	2213
1824	CAAGAAAA CUGAUGAG X CGAA ICUAGUGC	1490	GCACTAGC A TTTTCTTG	2214
1830	UUGGUUCA CUGAUGAG X CGAA IAAAAUGC	1491	GCATTTTC T TGAACCAA	2215
1836	ACAUUAUU CUGAUGAG X CGAA IUUCAAGA	1492	TCTTGAAC C AATAATGT	2216
1837	UACAUUAU CUGAUGAG X CGAA IGUUCAAG	1493	CTTGAACC A ATAATGTA	2217
1864	UGCAAGGC CUGAUGAG X CGAA IACAUCAA	1494	TTGATGTC A GCCTTGCA	2218
1867	UGAUGCAA CUGAUGAG X CGAA ICUGACAU	1495	ATGTCAGC C TTGCATCA	2219
1868	UUGAUGCA CUGAUGAG X CGAA IGCUGACA	1496	TGTCAGCC T TGCATCAA	2220
1872	GCCCUUGA CUGAUGAG X CGAA ICAAGGCU	1497	AGCCTTGC A TCAAGGGC	2221
1875	AAAGCCCU CUGAUGAG X CGAA IAUGCAAG	1498	CTTGCATC A AGGGCTTT	2222
1881	UUUGAUAA CUGAUGAG X CGAA ICCCUUGA	1499	TCAAGGGC T TTATCAAA	2223
1887	GUACUUUU CUGAUGAG X CGAA IAUAAAGC	1500	GCTTTATC A AAAAGTAC	2224
1896	UUUAUUAU CUGAUGAG X CGAA IUACUUUU	1501	AAAAGTAC A ATAATAAA	2225
1907	CUACCUGA CUGAUGAG X CGAA IAUUUAUU	1502	AATAAATC C TCAGGTAG	2226
1908	ACUACCUG CUGAUGAG X CGAA IGAUUUAU	1503	ATAAATCC T CAGGTAGT	2227
1910	GUACUACC CUGAUGAG X CGAA IAGGAUUU	1504	AAATCCTC A GGTAGTAC	2228
1919	CCAUUCCC CUGAUGAG X CGAA IUACUACC	1505	GGTAGTAC T GGGAATGG	2229
1933	CAUGGCAA CUGAUGAG X CGAA ICCUUCCA	1506	TGGAAGGC T TTGCCATG	2230
1938	AGGCCCAU CUGAUGAG X CGAA ICAAAGCC	1507	GGCTTTGC C ATGGGCCT	2231
1939	CAGGCCCA CUGAUGAG X CGAA IGCAAAGC	1508	GCTTTGCC A TGGGCCTG	2232
1945	ACGCAGCA CUGAUGAG X CGAA ICCCAUGG	1509	CCATGGGC C TGCTGCGT	2233
1946	GACGCAGC CUGAUGAG X CGAA IGCCCAUG	1510	CATGGGCC T GCTGCGTC	2234
1949	UCUGACGC CUGAUGAG X CGAA ICAGGCCC	1511	GGGCCTGC T GCGTCAGA	2235
1955	UACUGGUC CUGAUGAG X CGAA IACGCAGC	1512	GCTGCGTC A GACCAGTA	2236
1959	CCAGUACU CUGAUGAG X CGAA IUCUGACG	1513	CGTCAGAC C AGTACTGG	2237
1960	CCCAGUAC CUGAUGAG X CGAA IGUCUGAC	1514	GTCAGACC A GTACTGGG	2238
1965	UCCUUCCC CUGAUGAG X CGAA IUACUGGU	1515	ACCAGTAC T GGGAAGGA	2239
1988	AUAACAAC CUGAUGAG X CGAA ICUUACAA	1516	TTGTAAGC A GTTGTTAT	2240
2032	UAUAGCAU CUGAUGAG X CGAA IUUCUAUC	1517	GATAGAAC A ATGCTATA	2241
2037	UAUAUUAU CUGAUGAG X CGAA ICAUUGUU	1518	AACAATGC T ATAATATA	2242
2054	UACCCACG CUGAUGAG X CGAA IUUCAUUA	1519	TAATGAAC A CGTGGGTA	2243
2076	UCACAUCA CUGAUGAG X CGAA IUUUCUUA	1520	TAAGAAAC A TGATGTGA	2244
2091	CGGGACAA CUGAUGAG X CGAA IUAAUCUC	1521	GAGATTAC T TTGTCCCG	2245
2097	AAUAAGCG CUGAUGAG X CGAA IACAAAGU	1522	ACTTTGTC C CGCTTATT	2246

Table 4

2098	GAAUAAGC CUGAUGAG X CGAA IGACAAAG	1523	CTTTGTCC C GCTTATTC	2247
2101	GCAGAAUA CUGAUGAG X CGAA ICGGGACA	1524	TGTCCCGC T TATTCTGC	2248
2107	CAGGGAGC CUGAUGAG X CGAA IAAUAAGC	1525	GCTTATTC T GCTCCCTG	2249
2110	UAACAGGG CUGAUGAG X CGAA ICAGAAUA	1526	TATTCTGC T CCCTGTTA	2250
2112	GAUAACAG CUGAUGAG X CGAA IAGCAGAA	1527	TTCTGCTC C CTGTTATC	2251
2113	AGAUAACA CUGAUGAG X CGAA IGAGCAGA	1528	TCTGCTCC C TGTTATCT	2252
2114	CAGAUAAC CUGAUGAG X CGAA IGGAGCAG	1529	CTGCTCCC T GTTATCTG	2253
2121	GAUCUAGC CUGAUGAG X CGAA IAUAACAG	1530	CTGTTATC T GCTAGATC	2254
2124	CUAGAUCU CUGAUGAG X CGAA ICAGAUAA	1531	TTATCTGC T AGATCTAG	2255
2130	UGAGAACU CUGAUGAG X CGAA IAUCUAGC	1532	GCTAGATC T AGTTCTCA	2256
2136	AGUGAUUG CUGAUGAG X CGAA IAACUAGA	1533	TCTAGTTC T CAATCACT	2257
2138	GCAGUGAU CUGAUGAG X CGAA IAGAACUA	1534	TAGTTCTC A ATCACTGC	2258
2142	GGGAGCAG CUGAUGAG X CGAA IAUUGAGA	1535	TCTCAATC A CTGCTCCC	2259
2144	GGGGGAGC CUGAUGAG X CGAA IUGAUUGA	1536	TCAATCAC T GCTCCCCC	2260
2147	CACGGGGG CUGAUGAG X CGAA ICAGUGAU	1537	ATCACTGC T CCCCCGTG	2261
2149	CACACGGG CUGAUGAG X CGAA IAGCAGUG	1538	CACTGCTC C CCCGTGTG	2262
2150	ACACACGG CUGAUGAG X CGAA IGAGCAGU	1539	ACTGCTCC C CCGTGTGT	2263
2151	UACACACG CUGAUGAG X CGAA IGGAGCAG	1540	CTGCTCCC C CGTGTGTA	2264
2152	AUACACAC CUGAUGAG X CGAA IGGGAGCA	1541	TGCTCCCC C GTGTGTAT	2265
2169	ACCUUACA CUGAUGAG X CGAA ICAUUCUA	1542	TAGAATGC A TGTAAGGT	2266
2179	ACACAAGA CUGAUGAG X CGAA IACCUUAC	1543	GTAAGGTC T TCTTGTGT	2267
2182	AGGACACA CUGAUGAG X CGAA IAAGACCU	1544	AGGTCTTC T TGTGTCCT	2268
2189	UUUCAUCA CUGAUGAG X CGAA IACACAAG	1545	CTTGTGTC C TGATGAAA	2269
2190	UUUUCAUC CUGAUGAG X CGAA IGACACAA	1546	TTGTGTCC T GATGAAAA	2270
2207	UCAUUUCA CUGAUGAG X CGAA ICACAUAU	1547	ATATGTGC T TGAAATGA	2271
2221	GAGAUCAA CUGAUGAG X CGAA IUUUCUCA	1548	TGAGAAAC T TTGATCTC	2272
2228	GUAAGCAG CUGAUGAG X CGAA IAUCAAAG	1549	CTTTGATC T CTGCTTAC	2273
2230	UAGUAAGC CUGAUGAG X CGAA IAGAUCAA	1550	TTGATCTC T GCTTACTA	2274
2233	CAUUAGUA CUGAUGAG X CGAA ICAGAGAU	1551	ATCTCTGC T TACTAATG	2275
2237	GGCACAUU CUGAUGAG X CGAA IUAAGCAG	1552	CTGCTTAC T AATGTGCC	2276
2245	GGACAUGG CUGAUGAG X CGAA ICACAUUA	1553	TAATGTGC C CCATGTCC	2277
2246	UGGACAUG CUGAUGAG X CGAA IGCACAUU	1554	AATGTGCC C CATGTCCA	2278
2247	UUGGACAU CUGAUGAG X CGAA IGGCACAU	1555	ATGTGCCC C ATGTCCAA	2279
2248	CUUGGACA CUGAUGAG X CGAA IGGGCACA	1556	TGTGCCCC A TGTCCAAG	2280
2253	UUGGACUU CUGAUGAG X CGAA IACAUGGG	1557	CCCATGTC C AAGTCCAA	2281
2254	GUUGGACU CUGAUGAG X CGAA IGACAUGG	1558	CCATGTCC A AGTCCAAC	2282
2259	GGCAGGUU CUGAUGAG X CGAA IACUUGGA	1559	TCCAAGTC C AACCTGCC	2283
2260	AGGCAGGU CUGAUGAG X CGAA IGACUUGG	1560	CCAAGTCC A ACCTGCCT	2284
2263	CACAGGCA CUGAUGAG X CGAA IUUGGACU	1561	AGTCCAAC C TGCCTGTG	2285
2264	GCACAGGC CUGAUGAG X CGAA IGUUGGAC	1562	GTCCAACC T GCCTGTGC	2286
2267	CAUGCACA CUGAUGAG X CGAA ICAGGUUG	1563	CAACCTGC C TGTGCATG	2287
2268	UCAUGCAC CUGAUGAG X CGAA IGCAGGUU	1564	AACCTGCC T GTGCATGA	2288
2273	UCAGGUCA CUGAUGAG X CGAA ICACAGGC	1565	GCCTGTGC A TGACCTGA	2289
2278	AAUGAUCA CUGAUGAG X CGAA IUCAUGCA	1566	TGCATGAC C TGATCATT	2290
2279	UAAUGAUC CUGAUGAG X CGAA IGUCAUGC	1567	GCATGACC T GATCATTA	2291
2284	CCAUGUAA CUGAUGAG X CGAA IAUCAGGU	1568	ACCTGATC A TTACATGG	2292
2289	CACAGCCA CUGAUGAG X CGAA IUAAUGAU	1569	ATCATTAC A TGGCTGTG	2293

Table 4

2294	GGAACCAC CUGAUGAG X CGAA ICCAUGUA	1570	TACATGGC T GTGGTTCC	2294
2302	CAGGCUUA CUGAUGAG X CGAA IAACCACA	1571	TGTGGTTC C TAAGCCTG	2295
2303	ACAGGCUU CUGAUGAG X CGAA IGAACCAC	1572	GTGGTTCC T AAGCCTGT	2296
2308	CAGCAACA CUGAUGAG X CGAA ICUUAGGA	1573	TCCTAAGC C TGTTGCTG	2297
2309	UCAGCAAC CUGAUGAG X CGAA IGCUUAGG	1574	CCTAAGCC T GTTGCTGA	2298
2315	AUGACUUC CUGAUGAG X CGAA ICAACAGG	1575	CCTGTTGC T GAAGTCAT	2299
2322	AGCGACAA CUGAUGAG X CGAA IACUUCAG	1576	CTGAAGTC A TTGTCGCT	2300
2330	UAUUGCUG CUGAUGAG X CGAA ICGACAAU	1577	ATTGTCGC T CAGCAATA	2301
2332	CCUAUUGC CUGAUGAG X CGAA IAGCGACA	1578	TGTCGCTC A GCAATAGG	2302
2335	CACCCUAU CUGAUGAG X CGAA ICUGAGCG	1579	CGCTCAGC A ATAGGGTG	2303
2345	UGGAAAAC CUGAUGAG X CGAA ICACCCUA	1580	TAGGGTGC A GTTTTCCA	2304
2352	CUAUUCCU CUGAUGAG X CGAA IAAAACUG	1581	CAGTTTTC C AGGAATAG	2305
2353	CCUAUUCC CUGAUGAG X CGAA IGAAAACU	1582	AGTTTTCC A GGAATAGG	2306
2363	UAGGCAAA CUGAUGAG X CGAA ICCUAUUC	1583	GAATAGGC A TTTGCCTA	2307
2369	AGGAAUUA CUGAUGAG X CGAA ICAAAUGC	1584	GCATTTGC C TAATTCCT	2308
2370	CAGGAAUU CUGAUGAG X CGAA IGCAAAUG	1585	CATTTGCC T AATTCCTG	2309
2376	UCAUGCCA CUGAUGAG X CGAA IAAUUAGG	1586	CCTAATTC C TGGCATGA	2310
2377	GUCAUGCC CUGAUGAG X CGAA IGAAUUAG	1587	CTAATTCC T GGCATGAC	2311
2381	GAGUGUCA CUGAUGAG X CGAA ICCAGGAA	1588	TTCCTGGC A TGACACTC	2312
2386	CACUAGAG CUGAUGAG X CGAA IUCAUGCC	1589	GGCATGAC A CTCTAGTG	2313
2388	GUCACUAG CUGAUGAG X CGAA IUGUCAUG	1590	CATGACAC T CTAGTGAC	2314
2390	AAGUCACU CUGAUGAG X CGAA IAGUGUCA	1591	TGACACTC T AGTGACTT	2315
2397	CACCAGGA CUGAUGAG X CGAA IUCACUAG	1592	CTAGTGAC T TCCTGGTG	2316
2400	CCUCACCA CUGAUGAG X CGAA IAAGUCAC	1593	GTGACTTC C TGGTGAGG	2317
2401	GCCUCACC CUGAUGAG X CGAA IGAAGUCA	1594	TGACTTCC T GGTGAGGC	2318
2410	ACAGGCUG CUGAUGAG X CGAA ICCUCACC	1595	GGTGAGGC C CAGCCTGT	2319
2411	GACAGGCU CUGAUGAG X CGAA IGCCUCAC	1596	GTGAGGCC C AGCCTGTC	2320
2412	GGACAGGC CUGAUGAG X CGAA IGGCCUCA	1597	TGAGGCCC A GCCTGTCC	2321
2415	CCAGGACA CUGAUGAG X CGAA ICUGGGCC	1598	GGCCCAGC C TGTCCTGG	2322
2416	ACCAGGAC CUGAUGAG X CGAA IGCUGGGC	1599	GCCCAGCC T GTCCTGGT	2323
2420	CUGUACCA CUGAUGAG X CGAA IACAGGCU	1600	AGCCTGTC C TGGTACAG	2324
2421	GCUGUACC CUGAUGAG X CGAA IGACAGGC	1601	GCCTGTCC T GGTACAGC	2325
2427	GACCCUGC CUGAUGAG X CGAA IUACCAGG	1602	CCTGGTAC A GCAGGGTC	2326
2430	CAAGACCC CUGAUGAG X CGAA ICUGUACC	1603	GGTACAGC A GGGTCTTG	2327
2436	UUACAGCA CUGAUGAG X CGAA IACCCUGC	1604	GCAGGGTC T TGCTGTAA	2328
2440	UGAGUUAC CUGAUGAG X CGAA ICAAGACC	1605	GGTCTTGC T GTAACTCA	2329
2446	AAUGUCUG CUGAUGAG X CGAA IUUACAGC	1606	GCTGTAAC T CAGACATT	2330
2448	GGAAUGUC CUGAUGAG X CGAA IAGUUACA	1607	TGTAACTC A GACATTCC	2331
2452	CCUUGGAA CUGAUGAG X CGAA IUCUGAGU	1608	ACTCAGAC A TTCCAAGG	2332
2456	AUACCCUU CUGAUGAG X CGAA IAAUGUCU	1609	AGACATTC C AAGGGTAT	2333
2457	CAUACCCU CUGAUGAG X CGAA IGAAUGUC	1610	GACATTCC A AGGGTATG	2334
2472	GUGAAUAU CUGAUGAG X CGAA ICUUCCCA	1611	TGGGAAGC C ATATTCAC	2335
2473	UGUGAAUA CUGAUGAG X CGAA IGCUUCCC	1612	GGGAAGCC A TATTCACA	2336
2479	GUGAGGUG CUGAUGAG X CGAA IAAUAUGG	1613	CCATATTC A CACCTCAC	2337
2481	GCGUGAGG CUGAUGAG X CGAA IUGAAUAU	1614	ATATTCAC A CCTCACGC	2338
2483	GAGCGUGA CUGAUGAG X CGAA IUGUGAAU	1615	ATTCACAC C TCACGCTC	2339
2484	AGAGCGUG CUGAUGAG X CGAA IGUGUGAA	1616	TTCACACC T CACGCTCT	2340

Table 4

2486	CCAGAGCG CUGAUGAG X CGAA IAGGUGUG	1617	CACACCTC A CGCTCTGG	2341
2490	AUGUCCAG CUGAUGAG X CGAA ICGUGAGG	1618	CCTCACGC T CTGGACAT	2342
2492	UCAUGUCC CUGAUGAG X CGAA IAGCGUGA	1619	TCACGCTC T GGACATGA	2343
2497	CUAAAUCA CUGAUGAG X CGAA IUCCAGAG	1620	CTCTGGAC A TGATTTAG	2344
2512	GGUGUCCC CUGAUGAG X CGAA ICUUCCCU	1621	AGGGAAGC A GGGACACC	2345
2518	GCGGGGGG CUGAUGAG X CGAA IUCCCUGC	1622	GCAGGGAC A CCCCCCGC	2346
2520	GGGCGGGG CUGAUGAG X CGAA IUGUCCCU	1623	AGGGACAC C CCCCGCCC	2347
2521	GGGGCGGG CUGAUGAG X CGAA IGUGUCCC	1624	GGGACACC C CCCGCCCC	2348
2522	GGGGGCGG CUGAUGAG X CGAA IGGUGUCC	1625	GGACACCC C CCGCCCCC	2349
2523	GGGGGGCG CUGAUGAG X CGAA IGGGUGUC	1626	GACACCCC C CGCCCCCC	2350
2524	UGGGGGGC CUGAUGAG X CGAA IGGGGUGU	1627	ACACCCCC C GCCCCCCA	2351
2527	AGGUGGGG CUGAUGAG X CGAA ICGGGGGG	1628	CCCCCCGC C CCCCACCT	2352
2528	AAGGUGGG CUGAUGAG X CGAA IGCGGGGG	1629	CCCCCGCC C CCCACCTT	2353
2529	AAAGGUGG CUGAUGAG X CGAA IGGCGGGG	1630	CCCCGCCC C CCACCTTT	2354
2530	CAAAGGUG CUGAUGAG X CGAA IGGGCGGG	1631	CCCGCCCC C CACCTTTG	2355
2531	CCAAAGGU CUGAUGAG X CGAA IGGGGCGG	1632	CCGCCCCC C ACCTTTGG	2356
2532	CCCAAAGG CUGAUGAG X CGAA IGGGGGCG	1633	CGCCCCCC A CCTTTGGG	2357
2534	AUCCCAAA CUGAUGAG X CGAA IUGGGGGG	1634	CCCCCCAC C TTTGGGAT	2358
2535	GAUCCCAA CUGAUGAG X CGAA IGUGGGGG	1635	CCCCCACC T TTGGGATC	2359
2544	GCGGAGGC CUGAUGAG X CGAA IAUCCCAA	1636	TTGGGATC A GCCTCCGC	2360
2547	AUGGCGGA CUGAUGAG X CGAA ICUGAUCC	1637	GGATCAGC C TCCGCCAT	2361
2548	AAUGGCGG CUGAUGAG X CGAA IGCUGAUC	1638	GATCAGCC T CCGCCATT	2362
2550	GGAAUGGC CUGAUGAG X CGAA IAGGCUGA	1639	TCAGCCTC C GCCATTCC	2363
2553	CUUGGAAU CUGAUGAG X CGAA ICGGAGGC	1640	GCCTCCGC C ATTCCAAG	2364
2554	ACUUGGAA CUGAUGAG X CGAA IGCGGAGG	1641	CCTCCGCC A TTCCAAGT	2365
2558	GUCGACUU CUGAUGAG X CGAA IAAUGGCG	1642	CGCCATTC C AAGTCGAC	2366
2559	UGUCGACU CUGAUGAG X CGAA IGAAUGGC	1643	GCCATTCC A AGTCGACA	2367
2567	AAGAAGAG CUGAUGAG X CGAA IUCGACUU	1644	AAGTCGAC A CTCTTCTT	2368
2569	UCAAGAAG CUGAUGAG X CGAA IUGUCGAC	1645	GTCGACAC T CTTCTTGA	2369
2571	GCUCAAGA CUGAUGAG X CGAA IAGUGUCG	1646	CGACACTC T TCTTGAGC	2370
2574	UCUGCUCA CUGAUGAG X CGAA IAAGAGUG	1647	CACTCTTC T TGAGCAGA	2371
2580	UCACGGUC CUGAUGAG X CGAA ICUCAAGA	1648	TCTTGAGC A GACCGTGA	2372
2584	CAAAUCAC CUGAUGAG X CGAA IUCUGCUC	1649	GAGCAGAC C GTGATTTG	2373
2603	CCAGCAGG CUGAUGAG X CGAA ICCUCUCU	1650	AGAGAGGC A CCTGCTGG	2374
2605	UUCCAGCA CUGAUGAG X CGAA IUGCCUCU	1651	AGAGGCAC C TGCTGGAA	2375
2606	UUUCCAGC CUGAUGAG X CGAA IGUGCCUC	1652	GAGGCACC T GCTGGAAA	2376
2609	UGGUUUCC CUGAUGAG X CGAA ICAGGUGC	1653	GCACCTGC T GGAAACCA	2377
2616	AGAAGUGU CUGAUGAG X CGAA IUUUCCAG	1654	CTGGAAAC C ACACTTCT	2378
2617	AAGAAGUG CUGAUGAG X CGAA IGUUUCCA	1655	TGGAAACC A CACTTCTT	2379
2619	UCAAGAAG CUGAUGAG X CGAA IUGGUUUC	1656	GAAACCAC A CTTCTTGA	2380
2621	UUUCAAGA CUGAUGAG X CGAA IUGUGGUU	1657	AACCACAC T TCTTGAAA	2381
2624	CUGUUUCA CUGAUGAG X CGAA IAAGUGUG	1658	CACACTTC T TGAAACAG	2382
2631	ACCCAGGC CUGAUGAG X CGAA IUUUCAAG	1659	CTTGAAAC A GCCTGGGT	2383
2634	GUCACCCA CUGAUGAG X CGAA ICUGUUUC	1660	GAAACAGC C TGGGTGAC	2384
2635	CGUCACCC CUGAUGAG X CGAA IGCUGUUU	1661	AAACAGCC T GGGTGACG	2385
2647	UGCCUAAA CUGAUGAG X CGAA IACCGUCA	1662	TGACGGTC C TTTAGGCA	2386
2648	CUGCCUAA CUGAUGAG X CGAA IGACCGUC	1663	GACGGTCC T TTAGGCAG	2387

Table 4

2655	CGGCAGGC CUGAUGAG X CGAA ICCUAAAG	1664	CTTTAGGC A GCCTGCCG	2388
2658	CGGCGGCA CUGAUGAG X CGAA ICUGCCUA	1665	TAGGCAGC C TGCCGCCG	2389
2659	ACGGCGGC CUGAUGAG X CGAA IGCUGCCU	1666	AGGCAGCC T GCCGCCGT	2390
2662	GAGACGGC CUGAUGAG X CGAA ICAGGCUG	1667	CAGCCTGC C GCCGTCTC	2391
2665	ACAGAGAC CUGAUGAG X CGAA ICGGCAGG	1668	CCTGCCGC C GTCTCTGT	2392
2669	CGGGACAG CUGAUGAG X CGAA IACGGCGG	1669	CCGCCGTC T CTGTCCCG	2393
2671	ACCGGGAC CUGAUGAG X CGAA IAGACGGC	1670	GCCGTCTC T GTCCCGGT	2394
2675	GUGAACCG CUGAUGAG X CGAA IACAGAGA	1671	TCTCTGTC C CGGTTCAC	2395
2676	GGUGAACC CUGAUGAG X CGAA IGACAGAG	1672	CTCTGTCC C GGTTCACC	2396
2682	CGGCAAGG CUGAUGAG X CGAA IAACCGGG	1673	CCCGGTTC A CCTTGCCG	2397
2684	CUCGGCAA CUGAUGAG X CGAA IUGAACCG	1674	CGGTTCAC C TTGCCGAG	2398
2685	UCUCGGCA CUGAUGAG X CGAA IGUGAACC	1675	GGTTCACC T TGCCGAGA	2399
2689	CCUCUCUC CUGAUGAG X CGAA ICAAGGUG	1676	CACCTTGC C GAGAGAGG	2400
2704	GGUGGGGC CUGAUGAG X CGAA IACGCGCC	1677	GGCGCGTC T GCCCCACC	2401
2707	GAGGGUGG CUGAUGAG X CGAA ICAGACGC	1678	GCGTCTGC C CCACCCTC	2402
2708	UGAGGGUG CUGAUGAG X CGAA IGCAGACG	1679	CGTCTGCC C CACCCTCA	2403
2709	UUGAGGGU CUGAUGAG X CGAA IGGCAGAC	1680	GTCTGCCC C ACCCTCAA	2404
2710	UUUGAGGG CUGAUGAG X CGAA IGGGCAGA	1681	TCTGCCCC A CCCTCAAA	2405
2712	GGUUUGAG CUGAUGAG X CGAA IUGGGGCA	1682	TGCCCCAC C CTCAAACC	2406
2713	GGGUUUGA CUGAUGAG X CGAA IGUGGGGC	1683	GCCCCACC C TCAAACCC	2407
2714	AGGGUUUG CUGAUGAG X CGAA IGGUGGGG	1684	CCCCACCC T CAAACCCT	2408
2716	ACAGGGUU CUGAUGAG X CGAA IAGGGUGG	1685	CCACCCTC A AACCCTGT	2409
2720	CCCCACAG CUGAUGAG X CGAA IUUUGAGG	1686	CCTCAAAC C CTGTGGGG	2410
2721	GCCCCACA CUGAUGAG X CGAA IGUUUGAG	1687	CTCAAACC C TGTGGGGC	2411
2722	GGCCCCAC CUGAUGAG X CGAA IGGUUUGA	1688	TCAAACCC T GTGGGGCC	2412
2730	CACCAUCA CUGAUGAG X CGAA ICCCCACA	1689	TGTGGGGC C TGATGGTG	2413
2731	GCACCAUC CUGAUGAG X CGAA IGCCCCAC	1690	GTGGGGCC T GATGGTGC	2414
2740	GAGUCGUG CUGAUGAG X CGAA ICACCAUC	1691	GATGGTGC T CACGACTC	2415
2742	AAGAGUCG CUGAUGAG X CGAA IAGCACCA	1692	TGGTGCTC A CGACTCTT	2416
2747	GCAGGAAG CUGAUGAG X CGAA IUCGUGAG	1693	CTCACGAC T CTTCCTGC	2417
2749	UUGCAGGA CUGAUGAG X CGAA IAGUCGUG	1694	CACGACTC T TCCTGCAA	2418
2752	CCUUUGCA CUGAUGAG X CGAA IAAGAGUC	1695	GACTCTTC C TGCAAAGG	2419
2753	CCCUUUGC CUGAUGAG X CGAA IGAAGAGU	1696	ACTCTTCC T GCAAAGGG	2420
2756	GUUCCCUU CUGAUGAG X CGAA ICAGGAAG	1697	CTTCCTGC A AAGGGAAC	2421
2765	AGGUCUUC CUGAUGAG X CGAA IUUCCCUU	1698	AAGGGAAC T GAAGACCT	2422
2772	AAUGUGGA CUGAUGAG X CGAA IUCUUCAG	1699	CTGAAGAC C TCCACATT	2423
2773	UAAUGUGG CUGAUGAG X CGAA IGUCUUCA	1700	TGAAGACC T CCACATTA	2424
2775	CUUAAUGU CUGAUGAG X CGAA IAGGUCUU	1701	AAGACCTC C ACATTAAG	2425
2776	ACUUAAUG CUGAUGAG X CGAA IGAGGUCU	1702	AGACCTCC A CATTAAGT	2426
2778	CCACUUAA CUGAUGAG X CGAA IUGGAGGU	1703	ACCTCCAC A TTAAGTGG	2427
2788	UGUUAAAA CUGAUGAG X CGAA ICCACUUA	1704	TAAGTGGC T TTTTAACA	2428
2796	GUUUUUCA CUGAUGAG X CGAA IUUAAAAA	1705	TTTTTAAC A TGAAAAAC	2429
2805	AGCUGCCG CUGAUGAG X CGAA IUUUUUCA	1706	TGAAAAAC A CGGCAGCT	2430
2810	GCUACAGC CUGAUGAG X CGAA ICCGUGUU	1707	AACACGGC A GCTGTAGC	2431
2813	GGAGCUAC CUGAUGAG X CGAA ICUGCCGU	1708	ACGGCAGC T GTAGCTCC	2432
2819	AGCUCGGG CUGAUGAG X CGAA ICUACAGC	1709	GCTGTAGC T CCCGAGCT	2433
2821	GUAGCUCG CUGAUGAG X CGAA IAGCUACA	1710	TGTAGCTC C CGAGCTAC	2434

Table 4

2822	AGUAGCUC CUGAUGAG X CGAA IGAGCUAC	1711	GTAGCTCC C GAGCTACT	2435
2827	AAGAGAGU CUGAUGAG X CGAA ICUCGGGA	1712	TCCCGAGC T ACTCTCTT	2436
2830	GGCAAGAG CUGAUGAG X CGAA IUAGCUCG	1713	CGAGCTAC T CTCTTGCC	2437
2832	CUGGCAAG CUGAUGAG X CGAA IAGUAGCU	1714	AGCTACTC T CTTGCCAG	2438
2834	UGCUGGCA CUGAUGAG X CGAA IAGAGUAG	1715	CTACTCTC T TGCCAGCA	2439
2838	AAAAUGCU CUGAUGAG X CGAA ICAAGAGA	1716	TCTCTTGC C AGCATTTT	2440
2839	GAAAAUGC CUGAUGAG X CGAA IGCAAGAG	1717	CTCTTGCC A GCATTTTC	2441
2842	UGUGAAAA CUGAUGAG X CGAA ICUGGCAA	1718	TTGCCAGC A TTTTCACA	2442
2848	GCAAAAUG CUGAUGAG X CGAA IAAAAUGC	1719	GCATTTTC A CATTTTGC	2443
2850	AGGCAAAA CUGAUGAG X CGAA IUGAAAAU	1720	ATTTTCAC A TTTTGCCT	2444
2857	ACGAGAAA CUGAUGAG X CGAA ICAAAAUG	1721	CATTTTGC C TTTCTCGT	2445
2858	CACGAGAA CUGAUGAG X CGAA IGCAAAAU	1722	ATTTTGCC T TTCTCGTG	2446
2862	CUACCACG CUGAUGAG X CGAA IAAAGGCA	1723	TGCCTTTC T CGTGGTAG	2447
2875	UCUGUACU CUGAUGAG X CGAA ICUUCUAC	1724	GTAGAAGC C AGTACAGA	2448
2876	CUCUGUAC CUGAUGAG X CGAA IGCUUCUA	1725	TAGAAGCC A GTACAGAG	2449
2881	AAUUUCUC CUGAUGAG X CGAA IUACUGGC	1726	GCCAGTAC A GAGAAATT	2450
2891	CCCACCAC CUGAUGAG X CGAA IAAUUUCU	1727	AGAAATTC T GTGGTGGG	2451
2903	ACCUCGAA CUGAUGAG X CGAA IUUCCCAC	1728	GTGGGAAC A TTCGAGGT	2452
2915	CUGCAGGG CUGAUGAG X CGAA IACACCUC	1729	GAGGTGTC A CCCTGCAG	2453
2917	CUCUGCAG CUGAUGAG X CGAA IUGACACC	1730	GGTGTCAC C CTGCAGAG	2454
2918	GCUCUGCA CUGAUGAG X CGAA IGUGACAC	1731	GTGTCACC C TGCAGAGC	2455
2919	AGCUCUGC CUGAUGAG X CGAA IGGUGACA	1732	TGTCACCC T GCAGAGCT	2456
2922	CAUAGCUC CUGAUGAG X CGAA ICAGGGUG	1733	CACCCTGC A GAGCTATG	2457
2927	CUCACCAU CUGAUGAG X CGAA ICUCUGCA	1734	TGCAGAGC T ATGGTGAG	2458
2949	GGCACCUA CUGAUGAG X CGAA ICCUUAUC	1735	GATAAGGC T TAGGTGCC	2459
2957	UACAGCCU CUGAUGAG X CGAA ICACCUAA	1736	TTAGGTGC C AGGCTGTA	2460
2958	UUACAGCC CUGAUGAG X CGAA IGCACCUA	1737	TAGGTGCC A GGCTGTAA	2461
2962	AUGCUUAC CUGAUGAG X CGAA ICCUGGCA	1738	TGCCAGGC T GTAAGCAT	2462
2969	GCUCAGAA CUGAUGAG X CGAA ICUUACAG	1739	CTGTAAGC A TTCTGAGC	2463
2973	GCCAGCUC CUGAUGAG X CGAA IAAUGCUU	1740	AAGCATTC T GAGCTGGC	2464
2978	AACAAGCC CUGAUGAG X CGAA ICUCAGAA	1741	TTCTGAGC T GGCTTGTT	2465
2982	AAACAACA CUGAUGAG X CGAA ICCAGCUC	1742	GAGCTGGC T TGTTGTTT	2466
2998	CAUAUACA CUGAUGAG X CGAA IACUUAAA	1743	TTTAAGTC C TGTATATG	2467
2999	ACAUAUAC CUGAUGAG X CGAA IGACUUAA	1744	TTAAGTCC T GTATATGT	2468
3040	UUUUGAAA CUGAUGAG X CGAA ICUACUAU	1745	ATAGTAGC A TTTCAAAA	2469
3045	GUCCAUUU CUGAUGAG X CGAA IAAAUGCU	1746	AGCATTTC A AAATGGAC	2470
3058	GUUAAACC CUGAUGAG X CGAA IUACGUCC	1747	GGACGTAC T GGTTTAAC	2471
3067	GGAUAGGA CUGAUGAG X CGAA IUUAAACC	1748	GGTTTAAC C TCCTATCC	2472
3068	AGGAUAGG CUGAUGAG X CGAA IGUUAAAC	1749	GTTTAACC T CCTATCCT	2473
3070	CAAGGAUA CUGAUGAG X CGAA IAGGUUAA	1750	TTAACCTC C TATCCTTG	2474
3071	CCAAGGAU CUGAUGAG X CGAA IGAGGUUA	1751	TAACCTCC T ATCCTTGG	2475
3075	CUCUCCAA CUGAUGAG X CGAA IAUAGGAG	1752	CTCCTATC C TTGGAGAG	2476
3076	GCUCUCCA CUGAUGAG X CGAA IGAUAGGA	1753	TCCTATCC T TGGAGAGC	2477
3085	GAGCCAGC CUGAUGAG X CGAA ICUCUCCA	1754	TGGAGAGC A GCTGGCTC	2478
3088	GGAGAGCC CUGAUGAG X CGAA ICUGCUCU	1755	AGAGCAGC T GGCTCTCC	2479
3092	AGGUGGAG CUGAUGAG X CGAA ICCAGCUG	1756	CAGCTGGC T CTCCACCT	2480
3094	CAAGGUGG CUGAUGAG X CGAA IAGCCAGC	1757	GCTGGCTC T CCACCTTG	2481

Table 4

3096	AACAAGGU CUGAUGAG X CGAA IAGAGCCA	1758	TGGCTCTC C ACCTTGTT	2482
3097	UAACAAGG CUGAUGAG X CGAA IGAGAGCC	1759	GGCTCTCC A CCTTGTTA	2483
3099	UGUAACAA CUGAUGAG X CGAA IUGGAGAG	1760	CTCTCCAC C TTGTTACA	2484
3100	GUGUAACA CUGAUGAG X CGAA IGUGGAGA	1761	TCTCCACC T TGTTACAC	2485
3107	ACAUAAUG CUGAUGAG X CGAA IUAACAAG	1762	CTTGTTAC A CATTATGT	2486
3109	UAACAUAA CUGAUGAG X CGAA IUGUAACA	1763	TGTTACAC A TTATGTTA	2487
3132	AGCAGAGC CUGAUGAG X CGAA ICUCGCUA	1764	TAGCGAGC T GCTCTGCT	2488
3135	CAUAGCAG CUGAUGAG X CGAA ICAGCUCG	1765	CGAGCTGC T CTGCTATG	2489
3137	GACAUAGC CUGAUGAG X CGAA IAGCAGCU	1766	AGCTGCTC T GCTATGTC	2490
3140	AAGGACAU CUGAUGAG X CGAA ICAGAGCA	1767	TGCTCTGC T ATGTCCTT	2491
3146	UGGCUUAA CUGAUGAG X CGAA IACAUAGC	1768	GCTATGTC C TTAAGCCA	2492
3147	UUGGCUUA CUGAUGAG X CGAA IGACAUAG	1769	CTATGTCC T TAAGCCAA	2493
3153	UAAAUAUU CUGAUGAG X CGAA ICUUAAGG	1770	CCTTAAGC C AATATTTA	2494
3154	GUAAAUAU CUGAUGAG X CGAA IGCUUAAG	1771	CTTAAGCC A ATATTTAC	2495
3163	ACCUGAUG CUGAUGAG X CGAA IUAAAUAU	1772	ATATTTAC T CATCAGGT	2496
3165	UGACCUGA CUGAUGAG X CGAA IAGUAAAU	1773	ATTTACTC A TCAGGTCA	2497
3168	UAAUGACC CUGAUGAG X CGAA IAUGAGUA	1774	TACTCATC A GGTCATTA	2498
3173	AAAAAUAA CUGAUGAG X CGAA IACCUGAU	1775	ATCAGGTC A TTATTTTT	2499
3185	AUGGCCAU CUGAUGAG X CGAA IUAAAAAA	1776	TTTTTTAC A ATGGCCAT	2500
3191	UAUUCCAU CUGAUGAG X CGAA ICCAUUGU	1777	ACAATGGC C ATGGAATA	2501
3192	UUAUUCCA CUGAUGAG X CGAA IGCCAUUG	1778	CAATGGCC A TGGAATAA	2502
3203	GUAAAAAU CUGAUGAG X CGAA IUUUAUUC	1779	GAATAAAC C ATTTTTAC	2503
3204	UGUAAAAA CUGAUGAG X CGAA IGUUUAUU	1780	AATAAACC A TTTTTACA	2504

Table 5

Table 5: Human PTP-1B G-Cleaver Ribozyme and Target Sequence

Nt. position	Ribozyme Sequence	Seq. ID Nos.	Substrate Sequence	Seq. ID Nos.
25	CACUG UGAUG GCAUGCACUAUGC GCG GCCGUCUGCC	2505	GGCAGACGGC G CAGTG	2670
35	CUUCU UGAUG GCAUGCACUAUGC GCG GGCCCACUGC	2506	GCAGTGGGCC G AGAAG	2671
46	UGCUG UGAUG GCAUGCACUAUGC GCG GCCUCCUUCU	2507	AGAAGGAGGC G CAGCA	2672
55	CAGGG UGAUG GCAUGCACUAUGC GCG GGCUGCUGCG	2508	CGCAGCAGCC G CCCTG	2673
89	CUGCU UGAUG GCAUGCACUAUGC GCG GAACUCCUUU	2509	AAAGGAGTTC G AGCAG	2674
98	CUUGU UGAUG GCAUGCACUAUGC GCG GAUCUGCUCG	2510	CGAGCAGATC G ACAAG	2675
138	CAUGU UGAUG GCAUGCACUAUGC GCG GGAUAUCCUG	2511	CAGGATATCC G ACATG	2676
143	GGCUU UGAUG GCAUGCACUAUGC GCG AUGUCGGAUA	2512	TATCCGACAT G AAGCC	2677
152	GAAGU UGAUG GCAUGCACUAUGC GCG ACUGGCUUCA	2513	TGAAGCCAGT G ACTTC	2678
195	UAUUU UGAUG GCAUGCACUAUGC GCG GGUUUUUGUU	2514	AACAAAAACC G AAATA	2679
224	AUGGU UGAUG GCAUGCACUAUGC GCG AAAGGGACUG	2515	CAGTCCCTTT G ACCAT	2680
260	AUAGU UGAUG GCAUGCACUAUGC GCG AUUAUCUUCU	2516	AGAAGATAAT G ACTAT	2681
272	ACUAG UGAUG GCAUGCACUAUGC GCG GUUGAUAUAG	2517	CTATATCAAC G CTAGT	2682
280	UUUAU UGAUG GCAUGCACUAUGC GCG AAACUAGCGU	2518	ACGCTAGTTT G ATAAA	2683
331	UUAGG UGAUG GCAUGCACUAUGC GCG AAAGGGCCCU	2519	AGGGCCCTTT G CCTAA	2684
342	GACCG UGAUG GCAUGCACUAUGC GCG AUGUGUUAGG	2520	CCTAACACAT G CGGTC	2685
394	UUGAG UGAUG GCAUGCACUAUGC GCG AUGACGACAC	2521	GTGTCGTCAT G CTCAA	2686
406	UCCAU UGAUG GCAUGCACUAUGC GCG ACUCUGUUGA	2522	TCAACAGAGT G ATGGA	2687
429	GUGCG UGAUG GCAUGCACUAUGC GCG AUUUUAACGA	2523	TCGTTAAAAT G CGCAC	2688
431	UUGUG UGAUG GCAUGCACUAUGC GCG GCAUUUUAAC	2524	GTTAAAATGC G CACAA	2689
466	AAGAU UGAUG GCAUGCACUAUGC GCG AUCUCUUUUU	2525	AAAAAGAGAT G ATCTT	2690
473	GUCUU UGAUG GCAUGCACUAUGC GCG AAAGAUCAUC	2526	GATGATCTTT G AAGAC	2691
487	AAUUU UGAUG GCAUGCACUAUGC GCG AAAUUUGUGU	2527	ACACAAATTT G AAATT	2692
499	GAGAU UGAUG GCAUGCACUAUGC GCG AAUGUUAAUU	2528	AATTAACATT G ATCTC	2693
506	AUCUU UGAUG GCAUGCACUAUGC GCG AGAGAUCAAU	2529	ATTGATCTCT G AAGAT	2694
532	UGUCG UGAUG GCAUGCACUAUGC GCG ACUGUAUAAU	2530	ATTATACAGT G CGACA	2695
534	GCUGU UGAUG GCAUGCACUAUGC GCG GCACUGUAUA	2531	TATACAGTGC G ACAGC	2696
573	UCUCU UGAUG GCAUGCACUAUGC GCG GAGUUUCUUG	2532	CAAGAAACTC G AGAGA	2697

Table 5

608	AAAGU UGAUG GCAUGCACUAUGC GCG AGGCCAUGUG	2533	CACATGGCCT G ACTTT	2698
623	UGAUU UGAUG GCAUGCACUAUGC GCG AGGGACUCCA	2534	TGGAGTCCCT G AATCA	2699
643	AAGUU UGAUG GCAUGCACUAUGC GCG AAGAAUGAGG	2535	CCTCATTCTT G AACTT	2700
663	ACUCU UGAUG GCAUGCACUAUGC GCG GGACUUUGAA	2536	TTCAAAGTCC G AGAGT	2701
706	CAGUG UGAUG GCAUGCACUAUGC GCG ACCACAACGG	2537	CCGTTGTGGT G CACTG	2702
711	CACUG UGAUG GCAUGCACUAUGC GCG AGUGCACCAC	2538	GTGGTGCACT G CAGTG	2703
716	GCCUG UGAUG GCAUGCACUAUGC GCG ACUGCAGUGC	2539	GCACTGCAGT G CAGGC	2704
752	GGUAU UGAUG GCAUGCACUAUGC GCG AGCCAGACAG	2540	CTGTCTGGCT G ATACC	2705
759	AGAGG UGAUG GCAUGCACUAUGC GCG AGGUAUCAGC	2541	GCTGATACCT G CCTCT	2706
766	AUCAG UGAUG GCAUGCACUAUGC GCG AAGAGGCAGG	2542	CCTGCCTCTT G CTGAT	2707
769	UCCAU UGAUG GCAUGCACUAUGC GCG AGCAAGAGGC	2543	GCCTCTTGCT G ATGGA	2708
800	GAUAU UGAUG GCAUGCACUAUGC GCG AACGGAAGAA	2544	TTCTTCCGTT G ATATC	2709
814	AACAG UGAUG GCAUGCACUAUGC GCG ACUUUCUUGA	2545	TCAAGAAAGT G CTGTT	2710
826	UUCCU UGAUG GCAUGCACUAUGC GCG AUUUCUAACA	2546	TGTTAGAAAT G AGGAA	2711
847	UGGAU UGAUG GCAUGCACUAUGC GCG AGCCCCAUCC	2547	GGATGGGGCT G ATCCA	2712
860	CUGGU UGAUG GCAUGCACUAUGC GCG GGCUGUCUGG	2548	CCAGACAGCC G ACCAG	2713
868	AAGCG UGAUG GCAUGCACUAUGC GCG AGCUGGUCGG	2549	CCGACCAGCT G CGCTT	2714
870	AGAAG UGAUG GCAUGCACUAUGC GCG GCAGCUGGUC	2550	GACCAGCTGC G CTTCT	2715
889	UCGAU UGAUG GCAUGCACUAUGC GCG ACAGCCAGGU	2551	ACCTGGCTGT G ATCGA	2716
893	ACCUU UGAUG GCAUGCACUAUGC GCG GAUCACAGCC	2552	GGCTGTGATC G AAGGT	2717
899	UUUGG UGAUG GCAUGCACUAUGC GCG ACCUUCGAUC	2553	GATCGAAGGT G CCAAA	2718
928	UCCUG UGAUG GCAUGCACUAUGC GCG ACGGAAGAGU	2554	ACTCTTCCGT G CAGGA	2719
956	GUCCU UGAUG GCAUGCACUAUGC GCG GUGGGAAAGC	2555	GCTTTCCCAC G AGGAC	2720
977	AUGCU UGAUG GCAUGCACUAUGC GCG GGGUGGGGGC	2556	GCCCCCACCC G AGCAT	2721
1011	GGAUU UGAUG GCAUGCACUAUGC GCG GUUUGGGUGG	2557	CCACCCAAAC G AATCC	2722
1038	CCCUG UGAUG GCAUGCACUAUGC GCG AUUUCCCAUU	2558	AATGGGAAAT G CAGGG	2723
1069	UCCUU UGAUG GCAUGCACUAUGC GCG ACCCACUGGU	2559	ACCAGTGGGT G AAGGA	2724
1098	UGGGG UGAUG GCAUGCACUAUGC GCG AGUCUUUAUC	2560	GATAAAGACT G CCCCA	2725
1133	UGCGG UGAUG GCAUGCACUAUGC GCG AUUUAAGGGG	2561	CCCCTTAAAT G CCGCA	2726
1136	GGGUG UGAUG GCAUGCACUAUGC GCG GGCAUUUAAG	2562	CTTAAATGCC G CACCC	2727
1151	GCUUU UGAUG GCAUGCACUAUGC GCG GAUGCCGUAG	2563	CTACGGCATC G AAAGC	2728

Table 5

1159	UGACU UGAUG GCAUGCACUAUGC GCG AUGCUUUCGA	2564	TCGAAAGCAT G AGTCA	2729
1172	AACUU UGAUG GCAUGCACUAUGC GCG AGUGUCUUGA	2565	TCAAGACACT G AAGTT	2730
1206	CACCU UGAUG GCAUGCACUAUGC GCG GAAGACUUCC	2566	GGAAGTCTTC G AGGTG	2731
1211	CUGGG UGAUG GCAUGCACUAUGC GCG ACCUCGAAGA	2567	TCTTCGAGGT G CCCAG	2732
1220	GGAGG UGAUG GCAUGCACUAUGC GCG AGCCUGGGCA	2568	TGCCCAGGCT G CCTCC	2733
1249	UCGGG UGAUG GCAUGCACUAUGC GCG AGUGACGGCU	2569	AGCCGTCACT G CCCGA	2734
1253	CUUCU UGAUG GCAUGCACUAUGC GCG GGGCAGUGAC	2570	GTCACTGCCC G AGAAG	2735
1262	GUCCU UGAUG GCAUGCACUAUGC GCG GUCCUUCUCG	2571	CGAGAAGGAC G AGGAC	2736
1271	CAGUG UGAUG GCAUGCACUAUGC GCG AUGGUCCUCG	2572	CGAGGACCAT G CACTG	2737
1276	UAACU UGAUG GCAUGCACUAUGC GCG AGUGCAUGGU	2573	ACCATGCACT G AGTTA	2738
1308	CCACG UGAUG GCAUGCACUAUGC GCG ACAUGUUGAC	2574	GTCAACATGT G CGTGG	2739
1334	GUAAG UGAUG GCAUGCACUAUGC GCG GCCGGCCGUG	2575	CACGGCCGGC G CTTAC	2740
1344	UGUAG UGAUG GCAUGCACUAUGC GCG AGAGGUAAGC	2576	GCTTACCTCT G CTACA	2741
1379	AGGGU UGAUG GCAUGCACUAUGC GCG AGGCUAUGUG	2577	CACATAGCCT G ACCCT	2742
1412	AGAGG UGAUG GCAUGCACUAUGC GCG GGACAGUGGG	2578	CCCACTGTCC G CCTCT	2743
1418	GCGGG UGAUG GCAUGCACUAUGC GCG AGAGGCGGAC	2579	GTCCGCCTCT G CCCGC	2744
1422	CUCUG UGAUG GCAUGCACUAUGC GCG GGGCAGAGGC	2580	GCCTCTGCCC G CAGAG	2745
1433	UCGGG UGAUG GCAUGCACUAUGC GCG GUGGGCUCUG	2581	CAGAGCCCAC G CCCGA	2746
1437	CUAGU UGAUG GCAUGCACUAUGC GCG GGGCGUGGGC	2582	GCCCACGCCC G ACTAG	2747
1450	CGCGG UGAUG GCAUGCACUAUGC GCG AUGCCUGCUA	2583	TAGCAGGCAT G CCGCG	2748
1453	UACCG UGAUG GCAUGCACUAUGC GCG GGCAUGCCUG	2584	CAGGCATGCC G CGGTA	2749
1469	UCCGG UGAUG GCAUGCACUAUGC GCG GGCCCUUACC	2585	GGTAAGGGCC G CCGGA	2750
1477	CUACG UGAUG GCAUGCACUAUGC GCG GGUCCGGCGG	2586	CCGCCGGACC G CGTAG	2751
1513	UAGUG UGAUG GCAUGCACUAUGC GCG AGAACCAACG	2587	CGTTGGTTCT G CACTA	2752
1569	AGGGG UGAUG GCAUGCACUAUGC GCG AAAAAGUAAA	2588	TTTACTTTTT G CCCCT	2753
1583	GUACU UGAUG GCAUGCACUAUGC GCG AAAGUGGAAG	2589	CTTCCACTTT G AGTAC	2754
1610	CUCCU UGAUG GCAUGCACUAUGC GCG AAAAAAUGGC	2590	GCCATTTTTT G AGGAG	2755
1619	UCUUU UGAUG GCAUGCACUAUGC GCG ACUCUCCUCA	2591	TGAGGAGAGT G AAAGA	2756
1634	GCCAG UGAUG GCAUGCACUAUGC GCG AUGGUACUCU	2592	AGAGTACCAT G CTGGC	2757
1643	CUCUG UGAUG GCAUGCACUAUGC GCG GCCGCCAGCA	2593	TGCTGGCGGC G CAGAG	2758
1678	UGGGG UGAUG GCAUGCACUAUGC GCG GAGCCCCAAG	2594	CTTGGGGCTC G CCCCA	2759

Table 5

1723	UCUGG UGAUG GCAUGCACUAUGC GCG GUGCCGCCCG	2595	CGGGCGGCAC G CCAGA	2760
1742	AGAUU UGAUG GCAUGCACUAUGC GCG AAGGGGGGGG	2596	CCCCCCCCTT G AATCT	2761
1748	CCCUG UGAUG GCAUGCACUAUGC GCG AGAUUCAAGG	2597	CCTTGAATCT G CAGGG	2762
1811	UAGUG UGAUG GCAUGCACUAUGC GCG ACUAUGGAUG	2598	CATCCATAGT G CACTA	2763
1827	UGGUU UGAUG GCAUGCACUAUGC GCG AAGAAAAUGC	2599	GCATTTTCTT G AACCA	2764
1853	GACAU UGAUG GCAUGCACUAUGC GCG AAAAAAUUUU	2600	AAAATTTTTT G ATGTC	2765
1865	UGAUG UGAUG GCAUGCACUAUGC GCG AAGGCUGACA	2601	TGTCAGCCTT G CATCA	2766
1931	CAUGG UGAUG GCAUGCACUAUGC GCG AAAGCCUUCC	2602	GGAAGGCTTT G CCATG	2767
1942	CGCAG UGAUG GCAUGCACUAUGC GCG AGGCCCAUGG	2603	CCATGGGCCT G CTGCG	2768
1945	UGACG UGAUG GCAUGCACUAUGC GCG AGCAGGCCCA	2604	TGGGCCTGCT G CGTCA	2769
1997	AAUAU UGAUG GCAUGCACUAUGC GCG ACUAAAUAAC	2605	GTTATTTAGT G ATATT	2770
2014	CUUCU UGAUG GCAUGCACUAUGC GCG ACGUUACCCA	2606	TGGGTAACGT G AGAAG	2771
2030	UAUAG UGAUG GCAUGCACUAUGC GCG AUUGUUCUAU	2607	ATAGAACAAT G CTATA	2772
2045	GUGUU UGAUG GCAUGCACUAUGC GCG AUUAUAUAUU	2608	AATATATAAT G AACAC	2773
2073	CACAU UGAUG GCAUGCACUAUGC GCG AUGUUUCUUA	2609	TAAGAAACAT G ATGTG	2774
2078	AAUCU UGAUG GCAUGCACUAUGC GCG ACAUCAUGUU	2610	AACATGATGT G AGATT	2775
2094	AUAAG UGAUG GCAUGCACUAUGC GCG GGGACAAAGU	2611	ACTTTGTCCC G CTTAT	2776
2103	GGGAG UGAUG GCAUGCACUAUGC GCG AGAAUAAGCG	2612	CGCTTATTCT G CTCCC	2777
2117	UCUAG UGAUG GCAUGCACUAUGC GCG AGAUAACAGG	2613	CCTGTTATCT G CTAGA	2778
2140	GGGAG UGAUG GCAUGCACUAUGC GCG AGUGAUUGAG	2614	CTCAATCACT G CTCCC	2779
2162	ACAUG UGAUG GCAUGCACUAUGC GCG AUUCUAAUAC	2615	GTATTAGAAT G CATGT	2780
2186	UUCAU UGAUG GCAUGCACUAUGC GCG AGGACACAAG	2616	CTTGTGTCCT G ATGAA	2781
2189	UUUUU UGAUG GCAUGCACUAUGC GCG AUCAGGACAC	2617	GTGTCCTGAT G AAAAA	2782
2200	UCAAG UGAUG GCAUGCACUAUGC GCG ACAUAUUUUU	2618	AAAAATATGT G CTTGA	2783
2204	CAUUU UGAUG GCAUGCACUAUGC GCG AAGCACAUAU	2619	ATATGTGCTT G AAATG	2784
2209	UUUCU UGAUG GCAUGCACUAUGC GCG AUUUCAAGCA	2620	TGCTTGAAAT G AGAAA	2785
2219	GAGAU UGAUG GCAUGCACUAUGC GCG AAAGUUUCUC	2621	GAGAAACTTT G ATCTC	2786
2226	GUAAG UGAUG GCAUGCACUAUGC GCG AGAGAUCAAA	2622	TTTGATCTCT G CTTAC	2787
2238	UGGGG UGAUG GCAUGCACUAUGC GCG ACAUUAGUAA	2623	TTACTAATGT G CCCCA	2788
2260	ACAGG UGAUG GCAUGCACUAUGC GCG AGGUUGGACU	2624	AGTCCAACCT G CCTGT	2789
2266	UCAUG UGAUG GCAUGCACUAUGC GCG ACAGGCAGGU	2625	ACCTGCCTGT G CATGA	2790

Table 5

2270	CAGGU UGAUG GCAUGCACUAUGC GCG AUGCACAGGC	2626	GCCTGTGCAT G ACCTG	2791
2275	AUGAU UGAUG GCAUGCACUAUGC GCG AGGUCAUGCA	2627	TGCATGACCT G ATCAT	2792
2308	UUCAG UGAUG GCAUGCACUAUGC GCG AACAGGCUUA	2628	TAAGCCTGTT G CTGAA	2793
2311	GACUU UGAUG GCAUGCACUAUGC GCG AGCAACAGGC	2629	GCCTGTTGCT G AAGTC	2794
2323	CUGAG UGAUG GCAUGCACUAUGC GCG GACAAUGACU	2630	AGTCATTGTC G CTCAG	2795
2338	AACUG UGAUG GCAUGCACUAUGC GCG ACCCUAUUGC	2631	GCAATAGGGT G CAGTT	2796
2362	UUAGG UGAUG GCAUGCACUAUGC GCG AAAUGCCUAU	2632	ATAGGCATTT G CCTAA	2797
2378	AGUGU UGAUG GCAUGCACUAUGC GCG AUGCCAGGAA	2633	TTCCTGGCAT G ACACT	2798
2389	GAAGU UGAUG GCAUGCACUAUGC GCG ACUAGAGUGU	2634	ACACTCTAGT G ACTTC	2799
2400	GGCCU UGAUG GCAUGCACUAUGC GCG ACCAGGAAGU	2635	ACTTCCTGGT G AGGCC	2800
2433	UACAG UGAUG GCAUGCACUAUGC GCG AAGACCCUGC	2636	GCAGGGTCTT G CTGTA	2801
2483	CAGAG UGAUG GCAUGCACUAUGC GCG GUGAGGUGUG	2637	CACACCTCAC G CTCTG	2802
2494	UAAAU UGAUG GCAUGCACUAUGC GCG AUGUCCAGAG	2638	CTCTGGACAT G ATTTA	2803
2520	GGGGG UGAUG GCAUGCACUAUGC GCG GGGGGGUGUC	2639	GACACCCCCC G CCCCC	2804
2546	AAUGG UGAUG GCAUGCACUAUGC GCG GGAGGCUGAU	2640	ATCAGCCTCC G CCATT	2805
2559	AGUGU UGAUG GCAUGCACUAUGC GCG GACUUGGAAU	2641	ATTCCAAGTC G ACACT	2806
2571	CUGCU UGAUG GCAUGCACUAUGC GCG AAGAAGAGUG	2642	CACTCTTCTT G AGCAG	2807
2582	CAAAU UGAUG GCAUGCACUAUGC GCG ACGGUCUGCU	2643	AGCAGACCGT G ATTTG	2808
2602	UCCAG UGAUG GCAUGCACUAUGC GCG AGGUGCCUCU	2644	AGAGGCACCT G CTGGA	2809
2621	UGUUU UGAUG GCAUGCACUAUGC GCG AAGAAGUGUG	2645	CACACTTCTT G AAACA	2810
2635	ACCGU UGAUG GCAUGCACUAUGC GCG ACCCAGGCUG	2646	CAGCCTGGGT G ACGGT	2811
2655	GGCGG UGAUG GCAUGCACUAUGC GCG AGGCUGCCUA	2647	TAGGCAGCCT G CCGCC	2812
2658	GACGG UGAUG GCAUGCACUAUGC GCG GGCAGGCUGC	2648	GCAGCCTGCC G CCGTC	2813
2682	CUCGG UGAUG GCAUGCACUAUGC GCG AAGGUGAACC	2649	GGTTCACCTT G CCGAG	2814
2685	UCUCU UGAUG GCAUGCACUAUGC GCG GGCAAGGUGA	2650	TCACCTTGCC G AGAGA	2815
2694	AGACG UGAUG GCAUGCACUAUGC GCG GCCUCUCUCG	2651	CGAGAGAGGC G CGTCT	2816
2700	UGGGG UGAUG GCAUGCACUAUGC GCG AGACGCGCCU	2652	AGGCGCGTCT G CCCCA	2817
2727	ACCAU UGAUG GCAUGCACUAUGC GCG AGGCCCCACA	2653	TGTGGGGCCT G ATGGT	2818
2733	GUGAG UGAUG GCAUGCACUAUGC GCG ACCAUCAGGC	2654	GCCTGATGGT G CTCAC	2819
2739	AGAGU UGAUG GCAUGCACUAUGC GCG GUGAGCACCA	2655	TGGTGCTCAC G ACTCT	2820
2749	CUUUG UGAUG GCAUGCACUAUGC GCG AGGAAGAGUC	2656	GACTCTTCCT G CAAAG	2821

Table 5

2761	GUCUU UGAUG GCAUGCACUAUGC GCG AGUUCCCUUU	2657	AAAGGGAACT G AAGAC	2822
2793	UUUUU UGAUG GCAUGCACUAUGC GCG AUGUUAAAAA	2658	TTTTTAACAT G AAAAA	2823
2818	UAGCU UGAUG GCAUGCACUAUGC GCG GGGAGCUACA	2659	TGTAGCTCCC G AGCTA	2824
2831	GCUGG UGAUG GCAUGCACUAUGC GCG AAGAGAGUAG	2660	CTACTCTCTT G CCAGC	2825
2850	AAAGG UGAUG GCAUGCACUAUGC GCG AAAAUGUGAA	2661	TTCACATTTT G CCTTT	2826
2902	CACCU UGAUG GCAUGCACUAUGC GCG GAAUGUUCCC	2662	GGGAACATTC G AGGTG	2827
2915	CUCUG UGAUG GCAUGCACUAUGC GCG AGGGUGACAC	2663	GTGTCACCCT G CAGAG	2828
2928	CACCU UGAUG GCAUGCACUAUGC GCG ACCAUAGCUC	2664	GAGCTATGGT G AGGTG	2829
2950	CCUGG UGAUG GCAUGCACUAUGC GCG ACCUAAGCCU	2665	AGGCTTAGGT G CCAGG	2830
2969	CAGCU UGAUG GCAUGCACUAUGC GCG AGAAUGCUUA	2666	TAAGCATTCT G AGCTG	2831
3123	CAGCU UGAUG GCAUGCACUAUGC GCG GCUACCUCUC	2667	GAGAGGTAGC G AGCTG	2832
3128	CAGAG UGAUG GCAUGCACUAUGC GCG AGCUCGCUAC	2668	GTAGCGAGCT G CTCTG	2833
3133	CAUAG UGAUG GCAUGCACUAUGC GCG AGAGCAGCUC	2669	GAGCTGCTCT G CTATG	2834

Table 6

Table 6: Human PTP-1B DNAzyme and Target Sequence

Nt. Position	DNAzyme Sequence	Seq. ID Nos.	Substrate Sequence	Seq. ID Nos.
11	GCTCTAGG GGCTAGCTACAACGA CGCGTCGC	2835	GCGACGCG G CCUAGAGC	3545
18	GTCTGCCG GGCTAGCTACAACGA TCTAGGCC	2836	GGCCUAGA G CGGCAGAC	3546
21	GCCGTCTG GGCTAGCTACAACGA CGCTCTAG	2837	CUAGAGCG G CAGACGGC	3547
25	CTGCGCCG GGCTAGCTACAACGA CTGCCGCT	2838	AGCGGCAG A CGGCGCAG	3548
28	CCACTGCG GGCTAGCTACAACGA CGTCTGCC	2839	GGCAGACG G CGCAGUGG	3549
30	GCCCACTG GGCTAGCTACAACGA GCCGTCTG	2840	CAGACGGC G CAGUGGGC	3550
33	TCGGCCCA GGCTAGCTACAACGA TGCGCCGT	2841	ACGGCGCA G UGGGCCGA	3551
37	CTTCTCGG GGCTAGCTACAACGA CCACTGCG	2842	CGCAGUGG G CCGAGAAG	3552
49	CTGCTGCG GGCTAGCTACAACGA CTCCTTCT	2843	AGAAGGAG G CGCAGCAG	3553
51	GGCTGCTG GGCTAGCTACAACGA GCCTCCTT	2844	AAGGAGGC G CAGCAGCC	3554
54	GGCGGCTG GGCTAGCTACAACGA TGCGCCTC	2845	GAGGCGCA G CAGCCGCC	3555
57	CAGGGCGG GGCTAGCTACAACGA TGCTGCGC	2846	GCGCAGCA G CCGCCCUG	3556
60	GGCCAGGG GGCTAGCTACAACGA GGCTGCTG	2847	CAGCAGCC G CCCUGGCC	3557
66	ATGACGGG GGCTAGCTACAACGA CAGGGCGG	2848	CCGCCCUG G CCCGUCAU	3558
70	CTCCATGA GGCTAGCTACAACGA GGGCCAGG	2849	CCUGGCCC G UCAUGGAG	3559
73	CATCTCCA GGCTAGCTACAACGA GACGGGCC	2850	GGCCCGUC A UGGAGAUG	3560
79	CTTTTCCA GGCTAGCTACAACGA CTCCATGA	2851	UCAUGGAG A UGGAAAAG	3561
90	TGCTCGAA GGCTAGCTACAACGA TCCTTTTC	2852	GAAAAGGA G UUCGAGCA	3562
96	TCGATCTG GGCTAGCTACAACGA TCGAACTC	2853	GAGUUCGA G CAGAUCGA	3563
100	CTTGTCGA GGCTAGCTACAACGA CTGCTCGA	2854	UCGAGCAG A UCGACAAG	3564
104	CGGACTTG GGCTAGCTACAACGA CGATCTGC	2855	GCAGAUCG A CAAGUCCG	3565
108	CTCCCGGA GGCTAGCTACAACGA TTGTCGAT	2856	AUCGACAA G UCCGGGAG	3566
116	CCGCCCAG GGCTAGCTACAACGA TCCCGGAC	2857	GUCCGGGA G CUGGGCGG	3567
121	AATGGCCG GGCTAGCTACAACGA CCAGCTCC	2858	GGAGCUGG G CGGCCAUU	3568
124	GTAAATGG GGCTAGCTACAACGA CGCCCAGC	2859	GCUGGGCG G CCAUUUAC	3569
127	CTGGTAAA GGCTAGCTACAACGA GGCCGCCC	2860	GGGCGGCC A UUUACCAG	3570
131	TATCCTGG GGCTAGCTACAACGA AAATGGCC	2861	GGCCAUUU A CCAGGAUA	3571
137	GTCGGATA GGCTAGCTACAACGA CCTGGTAA	2862	UUACCAGG A UAUCCGAC	3572

Table 6

139	ATGTCGGA GGCTAGCTACAACGA ATCCTGGT	2863	ACCAGGAU A UCCGACAU	3573
144	GCTTCATG GGCTAGCTACAACGA CGGATATC	2864	GAUAUCCG A CAUGAAGC	3574
146	TGGCTTCA GGCTAGCTACAACGA GTCGGATA	2865	UAUCCGAC A UGAAGCCA	3575
151	GTCACTGG GGCTAGCTACAACGA TTCATGTC	2866	GACAUGAA G CCAGUGAC	3576
155	GGAAGTCA GGCTAGCTACAACGA TGGCTTCA	2867	UGAAGCCA G UGACUUCC	3577
158	ATGGGAAG GGCTAGCTACAACGA CACTGGCT	2868	AGCCAGUG A CUUCCCAU	3578
165	ACTCTACA GGCTAGCTACAACGA GGGAAGTC	2869	GACUUCCC A UGUAGAGU	3579
167	CCACTCTA GGCTAGCTACAACGA ATGGGAAG	2870	CUUCCCAU G UAGAGUGG	3580
172	CTTGGCCA GGCTAGCTACAACGA TCTACATG	2871	CAUGUAGA G UGGCCAAG	3581
175	AAGCTTGG GGCTAGCTACAACGA CACTCTAC	2872	GUAGAGUG G CCAAGCUU	3582
180	TTAGGAAG GGCTAGCTACAACGA TTGGCCAC	2873	GUGGCCAA G CUUCCUAA	3583
191	GGTTTTTG GGCTAGCTACAACGA TCTTAGGA	2874	UCCUAAGA A CAAAAACC	3584
197	TATTTCGG GGCTAGCTACAACGA TTTTGTTC	2875	GAACAAAA A CCGAAAUA	3585
203	TGTACCTA GGCTAGCTACAACGA TTCGGTTT	2876	AAACCGAA A UAGGUACA	3586
207	TCTCTGTA GGCTAGCTACAACGA CTATTTCG	2877	CGAAAUAG G UACAGAGA	3587
209	CGTCTCTG GGCTAGCTACAACGA ACCTATTT	2878	AAAUAGGU A CAGAGACG	3588
215	GACTGACG GGCTAGCTACAACGA CTCTGTAC	2879	GUACAGAG A CGUCAGUC	3589
217	GGGACTGA GGCTAGCTACAACGA GTCTCTGT	2880	ACAGAGAC G UCAGUCCC	3590
221	CAAAGGGA GGCTAGCTACAACGA TGACGTCT	2881	AGACGUCA G UCCCUUUG	3591
230	GACTATGG GGCTAGCTACAACGA CAAAGGGA	2882	UCCCUUUG A CCAUAGUC	3592
233	TCCGACTA GGCTAGCTACAACGA GGTCAAAG	2883	CUUUGACC A UAGUCGGA	3593
236	TAATCCGA GGCTAGCTACAACGA TATGGTCA	2884	UGACCAUA G UCGGAUUA	3594
241	TAGTTTAA GGCTAGCTACAACGA CCGACTAT	2885	AUAGUCGG A UUAAACUA	3595
246	TGATGTAG GGCTAGCTACAACGA TTAATCCG	2886	CGGAUUAA A CUACAUCA	3596
249	TCTTGATG GGCTAGCTACAACGA AGTTTAAT	2887	AUUAAACU A CAUCAAGA	3597
251	CTTCTTGA GGCTAGCTACAACGA GTAGTTTA	2888	UAAACUAC A UCAAGAAG	3598
260	AGTCATTA GGCTAGCTACAACGA CTTCTTGA	2889	UCAAGAAG A UAAUGACU	3599
263	TATAGTCA GGCTAGCTACAACGA TATCTTCT	2890	AGAAGAUA A UGACUAUA	3600
266	TGATATAG GGCTAGCTACAACGA CATTATCT	2891	AGAUAAUG A CUAUAUCA	3601
269	CGTTGATA GGCTAGCTACAACGA AGTCATTA	2892	UAAUGACU A UAUCAACG	3602
271	AGCGTTGA GGCTAGCTACAACGA ATAGTCAT	2893	AUGACUAU A UCAACGCU	3603

Table 6

275	AACTAGCG GGCTAGCTACAACGA TGATATAG	2894	CUAUAUCA A CGCUAGUU	3604
277	CAAACTAG GGCTAGCTACAACGA GTTGATAT	2895	AUAUCAAC G CUAGUUUG	3605
281	TTATCAAA GGCTAGCTACAACGA TAGCGTTG	2896	CAACGCUA G UUUGAUAA	3606
286	CATTTTTA GGCTAGCTACAACGA CAAACTAG	2897	CUAGUUUG A UAAAAAUG	3607
292	TTCTTCCA GGCTAGCTACAACGA TTTTATCA	2898	UGAUAAAA A UGGAAGAA	3608
301	CCTTTGGG GGCTAGCTACAACGA TTCTTCCA	2899	UGGAAGAA G CCCAAAGG	3609
311	GAATGTAA GGCTAGCTACAACGA TCCTTTGG	2900	CCAAAGGA G UUACAUUC	3610
314	TAAGAATG GGCTAGCTACAACGA AACTCCTT	2901	AAGGAGUU A CAUUCUUA	3611
316	GGTAAGAA GGCTAGCTACAACGA GTAACTCC	2902	GGAGUUAC A UUCUUACC	3612
322	GCCCTGGG GGCTAGCTACAACGA AAGAATGT	2903	ACAUUCUU A CCCAGGGC	3613
329	GCAAAGGG GGCTAGCTACAACGA CCTGGGTA	2904	UACCCAGG G CCCUUUGC	3614
336	GTGTTAGG GGCTAGCTACAACGA AAAGGGCC	2905	GGCCCUUU G CCUAACAC	3615
341	CGCATGTG GGCTAGCTACAACGA TAGGCAAA	2906	UUUGCCUA A CACAUGCG	3616
343	ACCGCATG GGCTAGCTACAACGA GTTAGGCA	2907	UGCCUAAC A CAUGCGGU	3617
345	TGACCGCA GGCTAGCTACAACGA GTGTTAGG	2908	CCUAACAC A UGCGGUCA	3618
347	AGTGACCG GGCTAGCTACAACGA ATGTGTTA	2909	UAACACAU G CGGUCACU	3619
350	AAAAGTGA GGCTAGCTACAACGA CGCATGTG	2910	CACAUGCG G UCACUUUU	3620
353	CCCAAAAG GGCTAGCTACAACGA GACCGCAT	2911	AUGCGGUC A CUUUUGGG	3621
364	CCACACCA GGCTAGCTACAACGA CTCCCAAA	2912	UUUGGGAG A UGGUGUGG	3622
367	CTCCCACA GGCTAGCTACAACGA CATCTCCC	2913	GGGAGAUG G UGUGGGAG	3623
369	TGCTCCCA GGCTAGCTACAACGA ACCATCTC	2914	GAGAUGGU G UGGGAGCA	3624
375	CTTTTCTG GGCTAGCTACAACGA TCCCACAC	2915	GUGUGGGA G CAGAAAAG	3625
383	CACCCCTG GGCTAGCTACAACGA TTTTCTGC	2916	GCAGAAAA G CAGGGGUG	3626
389	TGACGACA GGCTAGCTACAACGA CCCTGCTT	2917	AAGCAGGG G UGUCGUCA	3627
391	CATGACGA GGCTAGCTACAACGA ACCCCTGC	2918	GCAGGGGU G UCGUCAUG	3628
394	GAGCATGA GGCTAGCTACAACGA GACACCCC	2919	GGGGUGUC G UCAUGCUC	3629
397	GTTGAGCA GGCTAGCTACAACGA GACGACAC	2920	GUGUCGUC A UGCUCAAC	3630
399	CTGTTGAG GGCTAGCTACAACGA ATGACGAC	2921	GUCGUCAU G CUCAACAG	3631
404	TCACTCTG GGCTAGCTACAACGA TGAGCATG	2922	CAUGCUCA A CAGAGUGA	3632
409	CTCCATCA GGCTAGCTACAACGA TCTGTTGA	2923	UCAACAGA G UGAUGGAG	3633
412	TTTCTCCA GGCTAGCTACAACGA CACTCTGT	2924	ACAGAGUG A UGGAGAAA	3634

Table 6

422	TTAACGAA GGCTAGCTACAACGA CTTTCTCC	2925	GGAGAAAG G UUCGUUAA	3635
426	CATTTTAA GGCTAGCTACAACGA GAACCTTT	2926	AAAGGUUC G UUAAAAUG	3636
432	TGTGCGCA GGCTAGCTACAACGA TTTAACGA	2927	UCGUUAAA A UGCGCACA	3637
434	ATTGTGCG GGCTAGCTACAACGA ATTTTAAC	2928	GUUAAAAU G CGCACAAU	3638
436	GTATTGTG GGCTAGCTACAACGA GCATTTTA	2929	UAAAAUGC G CACAAUAC	3639
438	CAGTATTG GGCTAGCTACAACGA GCGCATTT	2930	AAAUGCGC A CAAUACUG	3640
441	GGCCAGTA GGCTAGCTACAACGA TGTGCGCA	2931	UGCGCACA A UACUGGCC	3641
443	GTGGCCAG GGCTAGCTACAACGA ATTGTGCG	2932	CGCACAAU A CUGGCCAC	3642
447	TTTTGTGG GGCTAGCTACAACGA CAGTATTG	2933	CAAUACUG G CCACAAAA	3643
450	TCTTTTTG GGCTAGCTACAACGA GGCCAGTA	2934	UACUGGCC A CAAAAAGA	3644
469	AAAGATCA GGCTAGCTACAACGA CTCTTTTT	2935	AAAAAGAG A UGAUCUUU	3645
472	TTCAAAGA GGCTAGCTACAACGA CATCTCTT	2936	AAGAGAUG A UCUUUGAA	3646
482	AATTTGTG GGCTAGCTACAACGA CTTCAAAG	2937	CUUUGAAG A CACAAAUU	3647
484	CAAATTTG GGCTAGCTACAACGA GTCTTCAA	2938	UUGAAGAC A CAAAUUUG	3648
488	ATTTCAAA GGCTAGCTACAACGA TTGTGTCT	2939	AGACACAA A UUUGAAAU	3649
495	AATGTTAA GGCTAGCTACAACGA TTCAAATT	2940	AAUUUGAA A UUAACAUU	3650
499	GATCAATG GGCTAGCTACAACGA TAATTTCA	2941	UGAAAUUA A CAUUGAUC	3651
501	GAGATCAA GGCTAGCTACAACGA GTTAATTT	2942	AAAUUAAC A UUGAUCUC	3652
505	TTCAGAGA GGCTAGCTACAACGA CAATGTTA	2943	UAACAUUG A UCUCUGAA	3653
515	ACTTGATA GGCTAGCTACAACGA CTTCAGAG	2944	CUCUGAAG A UAUCAAGU	3654
517	TGACTTGA GGCTAGCTACAACGA ATCTTCAG	2945	CUGAAGAU A UCAAGUCA	3655
522	TAATATGA GGCTAGCTACAACGA TTGATATC	2946	GAUAUCAA G UCAUAUUA	3656
525	GTATAATA GGCTAGCTACAACGA GACTTGAT	2947	AUCAAGUC A UAUUAUAC	3657
527	CTGTATAA GGCTAGCTACAACGA ATGACTTG	2948	CAAGUCAU A UUAUACAG	3658
530	GCACTGTA GGCTAGCTACAACGA AATATGAC	2949	GUCAUAUU A UACAGUGC	3659
532	TCGCACTG GGCTAGCTACAACGA ATAATATG	2950	CAUAUUAU A CAGUGCGA	3660
535	CTGTCGCA GGCTAGCTACAACGA TGTATAAT	2951	AUUAUACA G UGCGACAG	3661
537	AGCTGTCG GGCTAGCTACAACGA ACTGTATA	2952	UAUACAGU G CGACAGCU	3662
540	TCTAGCTG GGCTAGCTACAACGA CGCACTGT	2953	ACAGUGCG A CAGCUAGA	3663
543	AATTCTAG GGCTAGCTACAACGA TGTCGCAC	2954	GUGCGACA G CUAGAAUU	3664
549	TTTTCCAA GGCTAGCTACAACGA TCTAGCTG	2955	CAGCUAGA A UUGGAAAA	3665

Table 6

557	TTGTAAGG GGCTAGCTACAACGA TTTCCAAT	2956	AUUGGAAA A CCUUACAA	3666
562	TTGGGTTG GGCTAGCTACAACGA AAGGTTTT	2957	AAAACCUU A CAACCCAA	3667
565	TTCTTGGG GGCTAGCTACAACGA TGTAAGGT	2958	ACCUUACA A CCCAAGAA	3668
574	CTCTCGAG GGCTAGCTACAACGA TTCTTGGG	2959	CCCAAGAA A CUCGAGAG	3669
583	ATGTAAGA GGCTAGCTACAACGA CTCTCGAG	2960	CUCGAGAG A UCUUACAU	3670
588	TGGAAATG GGCTAGCTACAACGA AAGATCTC	2961	GAGAUCUU A CAUUUCCA	3671
590	AGTGGAAA GGCTAGCTACAACGA GTAAGATC	2962	GAUCUUAC A UUUCCACU	3672
596	TGGTATAG GGCTAGCTACAACGA GGAAATGT	2963	ACAUUUCC A CUAUACCA	3673
599	ATGTGGTA GGCTAGCTACAACGA AGTGGAAA	2964	UUUCCACU A UACCACAU	3674
601	CCATGTGG GGCTAGCTACAACGA ATAGTGGA	2965	UCCACUAU A CCACAUGG	3675
604	AGGCCATG GGCTAGCTACAACGA GGTATAGT	2966	ACUAUACC A CAUGGCCU	3676
606	TCAGGCCA GGCTAGCTACAACGA GTGGTATA	2967	UAUACCAC A UGGCCUGA	3677
609	AAGTCAGG GGCTAGCTACAACGA CATGTGGT	2968	ACCACAUG G CCUGACUU	3678
614	CTCCAAAG GGCTAGCTACAACGA CAGGCCAT	2969	AUGGCCUG A CUUUGGAG	3679
622	TTCAGGGA GGCTAGCTACAACGA TCCAAAGT	2970	ACUUUGGA G UCCCUGAA	3680
630	GCTGGTGA GGCTAGCTACAACGA TCAGGGAC	2971	GUCCCUGA A UCACCAGC	3681
633	GAGGCTGG GGCTAGCTACAACGA GATTCAGG	2972	CCUGAAUC A CCAGCCUC	3682
637	GAATGAGG GGCTAGCTACAACGA TGGTGATT	2973	AAUCACCA G CCUCAUUC	3683
642	TTCAAGAA GGCTAGCTACAACGA GAGGCTGG	2974	CCAGCCUC A UUCUUGAA	3684
650	AAAGAAAG GGCTAGCTACAACGA TCAAGAAT	2975	AUUCUUGA A CUUUCUUU	3685
664	CTCTCGGA GGCTAGCTACAACGA TTTGAAAA	2976	UUUUCAAA G UCCGAGAG	3686
672	GACCCTGA GGCTAGCTACAACGA TCTCGGAC	2977	GUCCGAGA G UCAGGGUC	3687
678	CTGAGTGA GGCTAGCTACAACGA CCTGACTC	2978	GAGUCAGG G UCACUCAG	3688
681	GGGCTGAG GGCTAGCTACAACGA GACCCTGA	2979	UCAGGGUC A CUCAGCCC	3689
686	GCTCCGGG GGCTAGCTACAACGA TGAGTGAC	2980	GUCACUCA G CCCGGAGC	3690
693	GGCCCGTG GGCTAGCTACAACGA TCCGGGCT	2981	AGCCCGGA G CACGGGCC	3691
695	CGGGCCCG GGCTAGCTACAACGA GCTCCGGG	2982	CCCGGAGC A CGGGCCCG	3692
699	ACAACGGG GGCTAGCTACAACGA CCGTGCTC	2983	GAGCACGG G CCCGUUGU	3693
703	CACCACAA GGCTAGCTACAACGA GGGCCCGT	2984	ACGGGCCC G UUGUGGUG	3694
706	GTGCACCA GGCTAGCTACAACGA AACGGGCC	2985	GGCCCGUU G UGGUGCAC	3695
709	GCAGTGCA GGCTAGCTACAACGA CACAACGG	2986	CCGUUGUG G UGCACUGC	3696

Table 6

711	CTGCAGTG GGCTAGCTACAACGA ACCACAAC	2987	GUUGUGGU G CACUGCAG	3697
713	CACTGCAG GGCTAGCTACAACGA GCACCACA	2988	UGUGGUGC A CUGCAGUG	3698
716	CTGCACTG GGCTAGCTACAACGA AGTGCACC	2989	GGUGCACU G CAGUGCAG	3699
719	TGCCTGCA GGCTAGCTACAACGA TGCAGTGC	2990	GCACUGCA G UGCAGGCA	3700
721	GATGCCTG GGCTAGCTACAACGA ACTGCAGT	2991	ACUGCAGU G CAGGCAUC	3701
725	TGCCGATG GGCTAGCTACAACGA CTGCACTG	2992	CAGUGCAG G CAUCGGCA	3702
727	CCTGCCGA GGCTAGCTACAACGA GCCTGCAC	2993	GUGCAGGC A UCGGCAGG	3703
731	CAGACCTG GGCTAGCTACAACGA CGATGCCT	2994	AGGCAUCG G CAGGUCUG	3704
735	GTTCCAGA GGCTAGCTACAACGA CTGCCGAT	2995	AUCGGCAG G UCUGGAAC	3705
742	ACAGAAGG GGCTAGCTACAACGA TCCAGACC	2996	GGUCUGGA A CCUUCUGU	3706
749	CAGCCAGA GGCTAGCTACAACGA AGAAGGTT	2997	AACCUUCU G UCUGGCUG	3707
754	GGTATCAG GGCTAGCTACAACGA CAGACAGA	2998	UCUGUCUG G CUGAUACC	3708
758	GGCAGGTA GGCTAGCTACAACGA CAGCCAGA	2999	UCUGGCUG A UACCUGCC	3709
760	GAGGCAGG GGCTAGCTACAACGA ATCAGCCA	3000	UGGCUGAU A CCUGCCUC	3710
764	GCAAGAGG GGCTAGCTACAACGA AGGTATCA	3001	UGAUACCU G CCUCUUGC	3711
771	TCCATCAG GGCTAGCTACAACGA AAGAGGCA	3002	UGCCUCUU G CUGAUGGA	3712
775	CTTGTCCA GGCTAGCTACAACGA CAGCAAGA	3003	UCUUGCUG A UGGACAAG	3713
779	TCCTCTTG GGCTAGCTACAACGA CCATCAGC	3004	GCUGAUGG A CAAGAGGA	3714
791	AAGAAGGG GGCTAGCTACAACGA CTTTCCTC	3005	GAGGAAAG A CCCUUCUU	3715
802	GATATCAA GGCTAGCTACAACGA GGAAGAAG	3006	CUUCUUCC G UUGAUAUC	3716
806	TCTTGATA GGCTAGCTACAACGA CAACGGAA	3007	UUCCGUUG A UAUCAAGA	3717
808	TTTCTTGA GGCTAGCTACAACGA ATCAACGG	3008	CCGUUGAU A UCAAGAAA	3718
817	TAACAGCA GGCTAGCTACAACGA TTTCTTGA	3009	UCAAGAAA G UGCUGUUA	3719
819	TCTAACAG GGCTAGCTACAACGA ACTTTCTT	3010	AAGAAAGU G CUGUUAGA	3720
822	ATTTCTAA GGCTAGCTACAACGA AGCACTTT	3011	AAAGUGCU G UUAGAAAU	3721
829	CTTCCTCA GGCTAGCTACAACGA TTCTAACA	3012	UGUUAGAA A UGAGGAAG	3722
837	ATCCGAAA GGCTAGCTACAACGA TTCCTCAT	3013	AUGAGGAA G UUUCGGAU	3723
844	CAGCCCCA GGCTAGCTACAACGA CCGAAACT	3014	AGUUUCGG A UGGGGCUG	3724
849	TGGATCAG GGCTAGCTACAACGA CCCATCCG	3015	CGGAUGGG G CUGAUCCA	3725
853	TGTCTGGA GGCTAGCTACAACGA CAGCCCCA	3016	UGGGGCUG A UCCAGACA	3726
859	GTCGGCTG GGCTAGCTACAACGA CTGGATCA	3017	UGAUCCAG A CAGCCGAC	3727

Table 6

862	CTGGTCGG GGCTAGCTACAACGA TGTCTGGA	3018	UCCAGACA G CCGACCAG	3728
866	GCAGCTGG GGCTAGCTACAACGA CGGCTGTC	3019	GACAGCCG A CCAGCUGC	3729
870	AAGCGCAG GGCTAGCTACAACGA TGGTCGGC	3020	GCCGACCA G CUGCGCUU	3730
873	GAGAAGCG GGCTAGCTACAACGA AGCTGGTC	3021	GACCAGCU G CGCUUCUC	3731
875	AGGAGAAG GGCTAGCTACAACGA GCAGCTGG	3022	CCAGCUGC G CUUCUCCU	3732
884	CAGCCAGG GGCTAGCTACAACGA AGGAGAAG	3023	CUUCUCCU A CCUGGCUG	3733
889	GATCACAG GGCTAGCTACAACGA CAGGTAGG	3024	CCUACCUG G CUGUGAUC	3734
892	TTCGATCA GGCTAGCTACAACGA AGCCAGGT	3025	ACCUGGCU G UGAUCGAA	3735
895	ACCTTCGA GGCTAGCTACAACGA CACAGCCA	3026	UGGCUGUG A UCGAAGGU	3736
902	ATTTGGCA GGCTAGCTACAACGA CTTCGATC	3027	GAUCGAAG G UGCCAAAU	3737
904	GAATTTGG GGCTAGCTACAACGA ACCTTCGA	3028	UCGAAGGU G CCAAAUUC	3738
909	ATGATGAA GGCTAGCTACAACGA TTGGCACC	3029	GGUGCCAA A UUCAUCAU	3739
913	CCCCATGA GGCTAGCTACAACGA GAATTTGG	3030	CCAAAUUC A UCAUGGGG	3740
916	GTCCCCCA GGCTAGCTACAACGA GATGAATT	3031	AAUUCAUC A UGGGGGAC	3741
923	CGGAAGAG GGCTAGCTACAACGA CCCCCATG	3032	CAUGGGGG A CUCUUCCG	3742
931	ATCCTGCA GGCTAGCTACAACGA GGAAGAGT	3033	ACUCUUCC G UGCAGGAU	3743
933	TGATCCTG GGCTAGCTACAACGA ACGGAAGA	3034	UCUUCCGU G CAGGAUCA	3744
938	TCCACTGA GGCTAGCTACAACGA CCTGCACG	3035	CGUGCAGG A UCAGUGGA	3745
942	TCCTTCCA GGCTAGCTACAACGA TGATCCTG	3036	CAGGAUCA G UGGAAGGA	3746
951	TGGGAAAG GGCTAGCTACAACGA TCCTTCCA	3037	UGGAAGGA G CUUUCCCA	3747
959	GGTCCTCG GGCTAGCTACAACGA GGGAAAGC	3038	GCUUUCCC A CGAGGACC	3748
965	GCTCCAGG GGCTAGCTACAACGA CCTCGTGG	3039	CCACGAGG A CCUGGAGC	3749
972	GGTGGGGG GGCTAGCTACAACGA TCCAGGTC	3040	GACCUGGA G CCCCCACC	3750
978	TGCTCGGG GGCTAGCTACAACGA GGGGGCTC	3041	GAGCCCCC A CCCGAGCA	3751
984	GGGATATG GGCTAGCTACAACGA TCGGGTGG	3042	CCACCCGA G CAUAUCCC	3752
986	GGGGGATA GGCTAGCTACAACGA GCTCGGGT	3043	ACCCGAGC A UAUCCCCC	3753
988	TGGGGGGA GGCTAGCTACAACGA ATGCTCGG	3044	CCGAGCAU A UCCCCCCA	3754
996	CGGGGAGG GGCTAGCTACAACGA GGGGGGAT	3045	AUCCCCCC A CCUCCCCG	3755
1005	TTGGGTGG GGCTAGCTACAACGA CGGGGAGG	3046	CCUCCCCG G CCACCCAA	3756
1008	CGTTTGGG GGCTAGCTACAACGA GGCCGGGG	3047	CCCCGGCC A CCCAAACG	3757
1014	AGGATTCG GGCTAGCTACAACGA TTGGGTGG	3048	CCACCCAA A CGAAUCCU	3758

Table 6

1018	CTCCAGGA GGCTAGCTACAACGA TCGTTTGG	3049	CCAAACGA A UCCUGGAG	3759
1026	TTGTGTGG GGCTAGCTACAACGA TCCAGGAT	3050	AUCCUGGA G CCACACAA	3760
1029	CCATTGTG GGCTAGCTACAACGA GGCTCCAG	3051	CUGGAGCC A CACAAUGG	3761
1031	TCCCATTG GGCTAGCTACAACGA GTGGCTCC	3052	GGAGCCAC A CAAUGGGA	3762
1034	ATTTCCCA GGCTAGCTACAACGA TGTGTGGC	3053	GCCACACA A UGGGAAAU	3763
1041	TCCCTGCA GGCTAGCTACAACGA TTCCCATT	3054	AAUGGGAA A UGCAGGGA	3764
1043	ACTCCCTG GGCTAGCTACAACGA ATTTCCCA	3055	UGGGAAAU G CAGGGAGU	3765
1050	GGGAAGAA GGCTAGCTACAACGA TCCCTGCA	3056	UGCAGGGA G UUCUUCCC	3766
1061	ACTGGTGA GGCTAGCTACAACGA TTGGGAAG	3057	CUUCCCAA A UCACCAGU	3767
1064	CCCACTGG GGCTAGCTACAACGA GATTTGGG	3058	CCCAAAUC A CCAGUGGG	3768
1068	TTCACCCA GGCTAGCTACAACGA TGGTGATT	3059	AAUCACCA G UGGGUGAA	3769
1072	TTCCTTCA GGCTAGCTACAACGA CCACTGGT	3060	ACCAGUGG G UGAAGGAA	3770
1084	CTCCTGGG GGCTAGCTACAACGA CTCTTCCT	3061	AGGAAGAG A CCCAGGAG	3771
1094	AGTCTTTA GGCTAGCTACAACGA CCTCCTGG	3062	CCAGGAGG A UAAAGACU	3772
1100	TGGGGCAG GGCTAGCTACAACGA CTTTATCC	3063	GGAUAAAG A CUGCCCCA	3773
1103	TGATGGGG GGCTAGCTACAACGA AGTCTTTA	3064	UAAAGACU G CCCCAUCA	3774
1108	TTCCTTGA GGCTAGCTACAACGA GGGGCAGT	3065	ACUGCCCC A UCAAGGAA	3775
1127	TTAAGGGG GGCTAGCTACAACGA TTCCTTTT	3066	AAAAGGAA G CCCCUUAA	3776
1136	GTGCGGCA GGCTAGCTACAACGA TTAAGGGG	3067	CCCCUUAA A UGCCGCAC	3777
1138	GGGTGCGG GGCTAGCTACAACGA ATTTAAGG	3068	CCUUAAAU G CCGCACCC	3778
1141	GTAGGGTG GGCTAGCTACAACGA GGCATTTA	3069	UAAAUGCC G CACCCUAC	3779
1143	CCGTAGGG GGCTAGCTACAACGA GCGGCATT	3070	AAUGCCGC A CCCUACGG	3780
1148	CGATGCCG GGCTAGCTACAACGA AGGGTGCG	3071	CGCACCCU A CGGCAUCG	3781
1151	TTTCGATG GGCTAGCTACAACGA CGTAGGGT	3072	ACCCUACG G CAUCGAAA	3782
1153	GCTTTCGA GGCTAGCTACAACGA GCCGTAGG	3073	CCUACGGC A UCGAAAGC	3783
1160	GACTCATG GGCTAGCTACAACGA TTTCGATG	3074	CAUCGAAA G CAUGAGUC	3784
1162	TTGACTCA GGCTAGCTACAACGA GCTTTCGA	3075	UCGAAAGC A UGAGUCAA	3785
1166	TGTCTTGA GGCTAGCTACAACGA TCATGCTT	3076	AAGCAUGA G UCAAGACA	3786
1172	CTTCAGTG GGCTAGCTACAACGA CTTGACTC	3077	GAGUCAAG A CACUGAAG	3787
1174	AACTTCAG GGCTAGCTACAACGA GTCTTGAC	3078	GUCAAGAC A CUGAAGUU	3788
1180	ACTTCTAA GGCTAGCTACAACGA TTCAGTGT	3079	ACACUGAA G UUAGAAGU	3789

Table 6

1187	CGACCCGA GGCTAGCTACAACGA TTCTAACT	3080	AGUUAGAA G UCGGGUCG	3790
1192	CCCCACGA GGCTAGCTACAACGA CCGACTTC	3081	GAAGUCGG G UCGUGGGG	3791
1195	TCCCCCCA GGCTAGCTACAACGA GACCCGAC	3082	GUCGGGUC G UGGGGGGA	3792
1205	CTCGAAGA GGCTAGCTACAACGA TTCCCCCC	3083	GGGGGGAA G UCUUCGAG	3793
1214	CCTGGGCA GGCTAGCTACAACGA CTCGAAGA	3084	UCUUCGAG G UGCCCAGG	3794
1216	AGCCTGGG GGCTAGCTACAACGA ACCTCGAA	3085	UUCGAGGU G CCCAGGCU	3795
1222	GGAGGCAG GGCTAGCTACAACGA CTGGGCAC	3086	GUGCCCAG G CUGCCUCC	3796
1225	TGGGGAGG GGCTAGCTACAACGA AGCCTGGG	3087	CCCAGGCU G CCUCCCCA	3797
1234	CCCTTTGG GGCTAGCTACAACGA TGGGGAGG	3088	CCUCCCCA G CCAAAGGG	3798
1245	AGTGACGG GGCTAGCTACAACGA TCCCCTTT	3089	AAAGGGGA G CCGUCACU	3799
1248	GGCAGTGA GGCTAGCTACAACGA GGCTCCCC	3090	GGGGAGCC G UCACUGCC	3800
1251	TCGGGCAG GGCTAGCTACAACGA GACGGCTC	3091	GAGCCGUC A CUGCCCGA	3801
1254	TTCTCGGG GGCTAGCTACAACGA AGTGACGG	3092	CCGUCACU G CCCGAGAA	3802
1265	GGTCCTCG GGCTAGCTACAACGA CCTTCTCG	3093	CGAGAAGG A CGAGGACC	3803
1271	GTGCATGG GGCTAGCTACAACGA CCTCGTCC	3094	GGACGAGG A CCAUGCAC	3804
1274	TCAGTGCA GGCTAGCTACAACGA GGTCCTCG	3095	CGAGGACC A UGCACUGA	3805
1276	ACTCAGTG GGCTAGCTACAACGA ATGGTCCT	3096	AGGACCAU G CACUGAGU	3806
1278	TAACTCAG GGCTAGCTACAACGA GCATGGTC	3097	GACCAUGC A CUGAGUUA	3807
1283	TCCAGTAA GGCTAGCTACAACGA TCAGTGCA	3098	UGCACUGA G UUACUGGA	3808
1286	GCTTCCAG GGCTAGCTACAACGA AACTCAGT	3099	ACUGAGUU A CUGGAAGC	3809
1293	AGGAAGGG GGCTAGCTACAACGA TTCCAGTA	3100	UACUGGAA G CCCUUCCU	3810
1303	CATGTTGA GGCTAGCTACAACGA CAGGAAGG	3101	CCUUCCUG G UCAACAUG	3811
1307	CGCACATG GGCTAGCTACAACGA TGACCAGG	3102	CCUGGUCA A CAUGUGCG	3812
1309	CACGCACA GGCTAGCTACAACGA GTTGACCA	3103	UGGUCAAC A UGUGCGUG	3813
1311	GCCACGCA GGCTAGCTACAACGA ATGTTGAC	3104	GUCAACAU G UGCGUGGC	3814
1313	TAGCCACG GGCTAGCTACAACGA ACATGTTG	3105	CAACAUGU G CGUGGCUA	3815
1315	CGTAGCCA GGCTAGCTACAACGA GCACATGT	3106	ACAUGUGC G UGGCUACG	3816
1318	GACCGTAG GGCTAGCTACAACGA CACGCACA	3107	UGUGCGUG G CUACGGUC	3817
1321	GAGGACCG GGCTAGCTACAACGA AGCCACGC	3108	GCGUGGCU A CGGUCCUC	3818
1324	CGTGAGGA GGCTAGCTACAACGA CGTAGCCA	3109	UGGCUACG G UCCUCACG	3819
1330	GCCGGCCG GGCTAGCTACAACGA GAGGACCG	3110	CGGUCCUC A CGGCCGGC	3820

Table 6

1333	AGCGCCGG GGCTAGCTACAACGA CGTGAGGA	3111	UCCUCACG G CCGGCGCU	3821
1337	GGTAAGCG GGCTAGCTACAACGA CGGCCGTG	3112	CACGGCCG G CGCUUACC	3822
1339	GAGGTAAG GGCTAGCTACAACGA GCCGGCCG	3113	CGGCCGGC G CUUACCUC	3823
1343	AGCAGAGG GGCTAGCTACAACGA AAGCGCCG	3114	CGGCGCUU A CCUCUGCU	3824
1349	ACCTGTAG GGCTAGCTACAACGA AGAGGTAA	3115	UUACCUCU G CUACAGGU	3825
1352	GGAACCTG GGCTAGCTACAACGA AGCAGAGG	3116	CCUCUGCU A CAGGUUCC	3826
1356	AACAGGAA GGCTAGCTACAACGA CTGTAGCA	3117	UGCUACAG G UUCCUGUU	3827
1362	CTGTTGAA GGCTAGCTACAACGA AGGAACCT	3118	AGGUUCCU G UUCAACAG	3828
1367	TGTTGCTG GGCTAGCTACAACGA TGAACAGG	3119	CCUGUUCA A CAGCAACA	3829
1370	ATGTGTTG GGCTAGCTACAACGA TGTTGAAC	3120	GUUCAACA G CAACACAU	3830
1373	GCTATGTG GGCTAGCTACAACGA TGCTGTTG	3121	CAACAGCA A CACAUAGC	3831
1375	AGGCTATG GGCTAGCTACAACGA GTTGCTGT	3122	ACAGCAAC A CAUAGCCU	3832
1377	TCAGGCTA GGCTAGCTACAACGA GTGTTGCT	3123	AGCAACAC A UAGCCUGA	3833
1380	GGGTCAGG GGCTAGCTACAACGA TATGTGTT	3124	AACACAUA G CCUGACCC	3834
1385	GAGGAGGG GGCTAGCTACAACGA CAGGCTAT	3125	AUAGCCUG A CCCUCCUC	3835
1395	AGGTGGAG GGCTAGCTACAACGA GGAGGAGG	3126	CCUCCUCC A CUCCACCU	3836
1400	GGTGGAGG GGCTAGCTACAACGA GGAGTGGA	3127	UCCACUCC A CCUCCACC	3837
1406	ACAGTGGG GGCTAGCTACAACGA GGAGGTGG	3128	CCACCUCC A CCCACUGU	3838
1410	GCGGACAG GGCTAGCTACAACGA GGGTGGAG	3129	CUCCACCC A CUGUCCGC	3839
1413	GAGGCGGA GGCTAGCTACAACGA AGTGGGTG	3130	CACCCACU G UCCGCCUC	3840
1417	GGCAGAGG GGCTAGCTACAACGA GGACAGTG	3131	CACUGUCC G CCUCUGCC	3841
1423	TCTGCGGG GGCTAGCTACAACGA AGAGGCGG	3132	CCGCCUCU G CCCGCAGA	3842
1427	GGGCTCTG GGCTAGCTACAACGA GGGCAGAG	3133	CUCUGCCC G CAGAGCCC	3843
1432	GGCGTGGG GGCTAGCTACAACGA TCTGCGGG	3134	CCCGCAGA G CCCACGCC	3844
1436	GTCGGGCG GGCTAGCTACAACGA GGGCTCTG	3135	CAGAGCCC A CGCCCGAC	3845
1438	TAGTCGGG GGCTAGCTACAACGA GTGGGCTC	3136	GAGCCCAC G CCCGACUA	3846
1443	CCTGCTAG GGCTAGCTACAACGA CGGGCGTG	3137	CACGCCCG A CUAGCAGG	3847
1447	CATGCCTG GGCTAGCTACAACGA TAGTCGGG	3138	CCCGACUA G CAGGCAUG	3848
1451	GCGGCATG GGCTAGCTACAACGA CTGCTAGT	3139	ACUAGCAG G CAUGCCGC	3849
1453	CCGCGGCA GGCTAGCTACAACGA GCCTGCTA	3140	UAGCAGGC A UGCCGCGG	3850
1455	TACCGCGG GGCTAGCTACAACGA ATGCCTGC	3141	GCAGGCAU G CCGCGGUA	3851

Table 6

1458	ACCTACCG GGCTAGCTACAACGA GGCATGCC	3142	GGCAUGCC G CGGUAGGU	3852
1461	CTTACCTA GGCTAGCTACAACGA CGCGGCAT	3143	AUGCCGCG G UAGGUAAG	3853
1465	GGCCCTTA GGCTAGCTACAACGA CTACCGCG	3144	CGCGGUAG G UAAGGGCC	3854
1471	TCCGGCGG GGCTAGCTACAACGA CCTTACCT	3145	AGGUAAGG G CCGCCGGA	3855
1474	CGGTCCGG GGCTAGCTACAACGA GGCCCTTA	3146	UAAGGGCC G CCGGACCG	3856
1479	CTACGCGG GGCTAGCTACAACGA CCGGCGGC	3147	GCCGCCGG A CCGCGUAG	3857
1482	TCTCTACG GGCTAGCTACAACGA GGTCCGGC	3148	GCCGGACC G CGUAGAGA	3858
1484	GCTCTCTA GGCTAGCTACAACGA GCGGTCCG	3149	CGGACCGC G UAGAGAGC	3859
1491	GGGCCCGG GGCTAGCTACAACGA TCTCTACG	3150	CGUAGAGA G CCGGGCCC	3860
1496	GTCCGGGG GGCTAGCTACAACGA CCGGCTCT	3151	AGAGCCGG G CCCCGGAC	3861
1503	AACGTCCG GGCTAGCTACAACGA CCGGGGCC	3152	GGCCCCGG A CGGACGUU	3862
1507	AACCAACG GGCTAGCTACAACGA CCGTCCGG	3153	CCGGACGG A CGUUGGUU	3863
1509	AGAACCAA GGCTAGCTACAACGA GTCCGTCC	3154	GGACGGAC G UUGGUUCU	3864
1513	GTGCAGAA GGCTAGCTACAACGA CAACGTCC	3155	GGACGUUG G UUCUGCAC	3865
1518	TTTTAGTG GGCTAGCTACAACGA AGAACCAA	3156	UUGGUUCU G CACUAAAA	3866
1520	GGTTTTAG GGCTAGCTACAACGA GCAGAACC	3157	GGUUCUGC A CUAAAACC	3867
1526	AAGATGGG GGCTAGCTACAACGA TTTAGTGC	3158	GCACUAAA A CCCAUCUU	3868
1530	GGGGAAGA GGCTAGCTACAACGA GGGTTTTA	3159	UAAAACCC A UCUUCCCC	3869
1541	GACACACA GGCTAGCTACAACGA CCGGGGAA	3160	UUCCCCGG A UGUGUGUC	3870
1543	GAGACACA GGCTAGCTACAACGA ATCCGGGG	3161	CCCCGGAU G UGUGUCUC	3871
1545	GTGAGACA GGCTAGCTACAACGA ACATCCGG	3162	CCGGAUGU G UGUCUCAC	3872
1547	GGGTGAGA GGCTAGCTACAACGA ACACATCC	3163	GGAUGUGU G UCUCACCC	3873
1552	ATGAGGGG GGCTAGCTACAACGA GAGACACA	3164	UGUGUCUC A CCCCUCAU	3874
1559	TAAAAGGA GGCTAGCTACAACGA GAGGGGTG	3165	CACCCCUC A UCCUUUUA	3875
1567	GCAAAAAG GGCTAGCTACAACGA AAAAGGAT	3166	AUCCUUUU A CUUUUUGC	3876
1574	GGAAGGGG GGCTAGCTACAACGA AAAAAGTA	3167	UACUUUUU G CCCCUUCC	3877
1583	ACTCAAAG GGCTAGCTACAACGA GGAAGGGG	3168	CCCCUUCC A CUUUGAGU	3878
1590	ATTTGGTA GGCTAGCTACAACGA TCAAAGTG	3169	CACUUUGA G UACCAAAU	3879
1592	GGATTTGG GGCTAGCTACAACGA ACTCAAAG	3170	CUUUGAGU A CCAAAUCC	3880
1597	CTTGTGGA GGCTAGCTACAACGA TTGGTACT	3171	AGUACCAA A UCCACAAG	3881
1601	ATGGCTTG GGCTAGCTACAACGA GGATTTGG	3172	CCAAAUCC A CAAGCCAU	3882

Table 6

1605	AAAAATGG GGCTAGCTACAACGA TTGTGGAT	3173	AUCCACAA G CCAUUUUU	3883
1608	TCAAAAAA GGCTAGCTACAACGA GGCTTGTG	3174	CACAAGCC A UUUUUUGA	3884
1622	CTCTTTCA GGCTAGCTACAACGA TCTCCTCA	3175	UGAGGAGA G UGAAAGAG	3885
1632	GCATGGTA GGCTAGCTACAACGA TCTCTTTC	3176	GAAAGAGA G UACCAUGC	3886
1634	CAGCATGG GGCTAGCTACAACGA ACTCTCTT	3177	AAGAGAGU A CCAUGCUG	3887
1637	CGCCAGCA GGCTAGCTACAACGA GGTACTCT	3178	AGAGUACC A UGCUGGCG	3888
1639	GCCGCCAG GGCTAGCTACAACGA ATGGTACT	3179	AGUACCAU G CUGGCGGC	3889
1643	CTGCGCCG GGCTAGCTACAACGA CAGCATGG	3180	CCAUGCUG G CGGCGCAG	3890
1646	CCTCTGCG GGCTAGCTACAACGA CGCCAGCA	3181	UGCUGGCG G CGCAGAGG	3891
1648	TCCCTCTG GGCTAGCTACAACGA GCCGCCAG	3182	CUGGCGGC G CAGAGGGA	3892
1661	GGTGTAGG GGCTAGCTACAACGA CCCTTCCC	3183	GGGAAGGG G CCUACACC	3893
1665	GACGGGTG GGCTAGCTACAACGA AGGCCCCT	3184	AGGGGCCU A CACCCGUC	3894
1667	AAGACGGG GGCTAGCTACAACGA GTAGGCCC	3185	GGGCCUAC A CCCGUCUU	3895
1671	CCCCAAGA GGCTAGCTACAACGA GGGTGTAG	3186	CUACACCC G UCUUGGGG	3896
1679	GGGGCGAG GGCTAGCTACAACGA CCCAAGAC	3187	GUCUUGGG G CUCGCCCC	3897
1683	GGGTGGGG GGCTAGCTACAACGA GAGCCCCA	3188	UGGGGCUC G CCCCACCC	3898
1688	GCCCTGGG GGCTAGCTACAACGA GGGGCGAG	3189	CUCGCCCC A CCCAGGGC	3899
1695	GGAGGGAG GGCTAGCTACAACGA CCTGGGTG	3190	CACCCAGG G CUCCCUCC	3900
1708	CTGGGATG GGCTAGCTACAACGA TCCAGGAG	3191	CUCCUGGA G CAUCCCAG	3901
1710	GCCTGGGA GGCTAGCTACAACGA GCTCCAGG	3192	CCUGGAGC A UCCCAGGC	3902
1717	GCCGCCCG GGCTAGCTACAACGA CTGGGATG	3193	CAUCCCAG G CGGGCGGC	3903
1721	GCGTGCCG GGCTAGCTACAACGA CCGCCTGG	3194	CCAGGCGG G CGGCACGC	3904
1724	CTGGCGTG GGCTAGCTACAACGA CGCCCGCC	3195	GGCGGGCG G CACGCCAG	3905
1726	GTCTGGCG GGCTAGCTACAACGA GCCGCCCG	3196	CGGGCGGC A CGCCAGAC	3906
1728	CTGTCTGG GGCTAGCTACAACGA GTGCCGCC	3197	GGCGGCAC G CCAGACAG	3907
1733	GGGGGCTG GGCTAGCTACAACGA CTGGCGTG	3198	CACGCCAG A CAGCCCCC	3908
1736	GGGGGGGG GGCTAGCTACAACGA TGTCTGGC	3199	GCCAGACA G CCCCCCCC	3909
1749	CCTGCAGA GGCTAGCTACAACGA TCAAGGGG	3200	CCCCUUGA A UCUGCAGG	3910
1753	GCTCCCTG GGCTAGCTACAACGA AGATTCAA	3201	UUGAAUCU G CAGGGAGC	3911
1760	GAGAGTTG GGCTAGCTACAACGA TCCCTGCA	3202	UGCAGGGA G CAACUCUC	3912
1763	GTGGAGAG GGCTAGCTACAACGA TGCTCCCT	3203	AGGGAGCA A CUCUCCAC	3913

Table 6

1770	ATATGGAG GGCTAGCTACAACGA GGAGAGTT	3204	AACUCUCC A CUCCAUAU	3914
1775	AATAAATA GGCTAGCTACAACGA GGAGTGGA	3205	UCCACUCC A UAUUUAUU	3915
1777	TAAATAAA GGCTAGCTACAACGA ATGGAGTG	3206	CACUCCAU A UUUAUUUA	3916
1781	TGTTTAAA GGCTAGCTACAACGA AAATATGG	3207	CCAUAUUU A UUUAAACA	3917
1787	AAAAATTG GGCTAGCTACAACGA TTAAATAA	3208	UUAUUUAA A CAAUUUUU	3918
1790	GGAAAAAA GGCTAGCTACAACGA TGTTTAAA	3209	UUUAAACA A UUUUUUCC	3919
1805	TATGGATG GGCTAGCTACAACGA CTTTGGGG	3210	CCCCAAAG G CAUCCAUA	3920
1807	ACTATGGA GGCTAGCTACAACGA GCCTTTGG	3211	CCAAAGGC A UCCAUAGU	3921
1811	GTGCACTA GGCTAGCTACAACGA GGATGCCT	3212	AGGCAUCC A UAGUGCAC	3922
1814	CTAGTGCA GGCTAGCTACAACGA TATGGATG	3213	CAUCCAUA G UGCACUAG	3923
1816	TGCTAGTG GGCTAGCTACAACGA ACTATGGA	3214	UCCAUAGU G CACUAGCA	3924
1818	AATGCTAG GGCTAGCTACAACGA GCACTATG	3215	CAUAGUGC A CUAGCAUU	3925
1822	AGAAAATG GGCTAGCTACAACGA TAGTGCAC	3216	GUGCACUA G CAUUUUCU	3926
1824	CAAGAAAA GGCTAGCTACAACGA GCTAGTGC	3217	GCACUAGC A UUUUCUUG	3927
1834	ATTATTGG GGCTAGCTACAACGA TCAAGAAA	3218	UUUCUUGA A CCAAUAAU	3928
1838	ATACATTA GGCTAGCTACAACGA TGGTTCAA	3219	UUGAACCA A UAAUGUAU	3929
1841	TTAATACA GGCTAGCTACAACGA TATTGGTT	3220	AACCAAUA A UGUAUUAA	3930
1843	TTTTAATA GGCTAGCTACAACGA ATTATTGG	3221	CCAAUAAU G UAUUAAAA	3931
1845	AATTTTAA GGCTAGCTACAACGA ACATTATT	3222	AAUAAUGU A UUAAAAUU	3932
1851	TCAAAAAA GGCTAGCTACAACGA TTTAATAC	3223	GUAUUAAA A UUUUUUGA	3933
1859	GGCTGACA GGCTAGCTACAACGA CAAAAAAT	3224	AUUUUUUG A UGUCAGCC	3934
1861	AAGGCTGA GGCTAGCTACAACGA ATCAAAAA	3225	UUUUUGAU G UCAGCCUU	3935
1865	ATGCAAGG GGCTAGCTACAACGA TGACATCA	3226	UGAUGUCA G CCUUGCAU	3936
1870	CCTTGATG GGCTAGCTACAACGA AAGGCTGA	3227	UCAGCCUU G CAUCAAGG	3937
1872	GCCCTTGA GGCTAGCTACAACGA GCAAGGCT	3228	AGCCUUGC A UCAAGGGC	3938
1879	TGATAAAG GGCTAGCTACAACGA CCTTGATG	3229	CAUCAAGG G CUUUAUCA	3939
1884	CTTTTTGA GGCTAGCTACAACGA AAAGCCCT	3230	AGGGCUUU A UCAAAAAG	3940
1892	TTATTGTA GGCTAGCTACAACGA TTTTTGAT	3231	AUCAAAAA G UACAAUAA	3941
1894	TATTATTG GGCTAGCTACAACGA ACTTTTTG	3232	CAAAAAGU A CAAUAAUA	3942
1897	ATTTATTA GGCTAGCTACAACGA TGTACTTT	3233	AAAGUACA A UAAUAAAU	3943
1900	AGGATTTA GGCTAGCTACAACGA TATTGTAC	3234	GUACAAUA A UAAAUCCU	3944

Table 6

1904	CCTGAGGA GGCTAGCTACAACGA TTATTATT	3235	AAUAAUAA A UCCUCAGG	3945
1912	CAGTACTA GGCTAGCTACAACGA CTGAGGAT	3236	AUCCUCAG G UAGUACUG	3946
1915	TCCCAGTA GGCTAGCTACAACGA TACCTGAG	3237	CUCAGGUA G UACUGGGA	3947
1917	ATTCCCAG GGCTAGCTACAACGA ACTACCTG	3238	CAGGUAGU A CUGGGAAU	3948
1924	GCCTTCCA GGCTAGCTACAACGA TCCCAGTA	3239	UACUGGGA A UGGAAGGC	3949
1931	TGGCAAAG GGCTAGCTACAACGA CTTCCATT	3240	AAUGGAAG G CUUUGCCA	3950
1936	GCCCATGG GGCTAGCTACAACGA AAAGCCTT	3241	AAGGCUUU G CCAUGGGC	3951
1939	CAGGCCCA GGCTAGCTACAACGA GGCAAAGC	3242	GCUUUGCC A UGGGCCUG	3952
1943	GCAGCAGG GGCTAGCTACAACGA CCATGGCA	3243	UGCCAUGG G CCUGCUGC	3953
1947	TGACGCAG GGCTAGCTACAACGA AGGCCCAT	3244	AUGGGCCU G CUGCGUCA	3954
1950	GTCTGACG GGCTAGCTACAACGA AGCAGGCC	3245	GGCCUGCU G CGUCAGAC	3955
1952	TGGTCTGA GGCTAGCTACAACGA GCAGCAGG	3246	CCUGCUGC G UCAGACCA	3956
1957	AGTACTGG GGCTAGCTACAACGA CTGACGCA	3247	UGCGUCAG A CCAGUACU	3957
1961	TCCCAGTA GGCTAGCTACAACGA TGGTCTGA	3248	UCAGACCA G UACUGGGA	3958
1963	CTTCCCAG GGCTAGCTACAACGA ACTGGTCT	3249	AGACCAGU A CUGGGAAG	3959
1976	TACAACCG GGCTAGCTACAACGA CCTCCTTC	3250	GAAGGAGG A CGGUUGUA	3960
1979	GCTTACAA GGCTAGCTACAACGA CGTCCTCC	3251	GGAGGACG G UUGUAAGC	3961
1982	ACTGCTTA GGCTAGCTACAACGA AACCGTCC	3252	GGACGGUU G UAAGCAGU	3962
1986	AACAACTG GGCTAGCTACAACGA TTACAACC	3253	GGUUGUAA G CAGUUGUU	3963
1989	AATAACAA GGCTAGCTACAACGA TGCTTACA	3254	UGUAAGCA G UUGUUAUU	3964
1992	CTAAATAA GGCTAGCTACAACGA AACTGCTT	3255	AAGCAGUU G UUAUUUAG	3965
1995	TCACTAAA GGCTAGCTACAACGA AACAACTG	3256	CAGUUGUU A UUUAGUGA	3966
2000	CAATATCA GGCTAGCTACAACGA TAAATAAC	3257	GUUAUUUA G UGAUAUUG	3967
2003	CCACAATA GGCTAGCTACAACGA CACTAAAT	3258	AUUUAGUG A UAUUGUGG	3968
2005	ACCCACAA GGCTAGCTACAACGA ATCACTAA	3259	UUAGUGAU A UUGUGGGU	3969
2008	GTTACCCA GGCTAGCTACAACGA AATATCAC	3260	GUGAUAUU G UGGGUAAC	3970
2012	TCACGTTA GGCTAGCTACAACGA CCACAATA	3261	UAUUGUGG G UAACGUGA	3971
2015	TTCTCACG GGCTAGCTACAACGA TACCCACA	3262	UGUGGGUA A CGUGAGAA	3972
2017	TCTTCTCA GGCTAGCTACAACGA GTTACCCA	3263	UGGGUAAC G UGAGAAGA	3973
2025	TTGTTCTA GGCTAGCTACAACGA CTTCTCAC	3264	GUGAGAAG A UAGAACAA	3974
2030	TAGCATTG GGCTAGCTACAACGA TCTATCTT	3265	AAGAUAGA A CAAUGCUA	3975

Table 6

2033	TTATAGCA GGCTAGCTACAACGA TGTTCTAT	3266	AUAGAACA A UGCUAUAA	3976
2035	TATTATAG GGCTAGCTACAACGA ATTGTTCT	3267	AGAACAAU G CUAUAAUA	3977
2038	ATATATTA GGCTAGCTACAACGA AGCATTGT	3268	ACAAUGCU A UAAUAUAU	3978
2041	ATTATATA GGCTAGCTACAACGA TATAGCAT	3269	AUGCUAUA A UAUAUAAU	3979
2043	TCATTATA GGCTAGCTACAACGA ATTATAGC	3270	GCUAUAAU A UAUAAUGA	3980
2045	GTTCATTA GGCTAGCTACAACGA ATATTATA	3271	UAUAAUAU A UAAUGAAC	3981
2048	CGTGTTCA GGCTAGCTACAACGA TATATATT	3272	AAUAUAUA A UGAACACG	3982
2052	CCCACGTG GGCTAGCTACAACGA TCATTATA	3273	UAUAAUGA A CACGUGGG	3983
2054	TACCCACG GGCTAGCTACAACGA GTTCATTA	3274	UAAUGAAC A CGUGGGUA	3984
2056	AATACCCA GGCTAGCTACAACGA GTGTTCAT	3275	AUGAACAC G UGGGUAUU	3985
2060	ATTAAATA GGCTAGCTACAACGA CCACGTGT	3276	ACACGUGG G UAUUUAAU	3986
2062	TTATTAAA GGCTAGCTACAACGA ACCCACGT	3277	ACGUGGGU A UUUAAUAA	3987
2067	GTTTCTTA GGCTAGCTACAACGA TAAATACC	3278	GGUAUUUA A UAAGAAAC	3988
2074	ACATCATG GGCTAGCTACAACGA TTCTTATT	3279	AAUAAGAA A CAUGAUGU	3989
2076	TCACATCA GGCTAGCTACAACGA GTTTCTTA	3280	UAAGAAAC A UGAUGUGA	3990
2079	ATCTCACA GGCTAGCTACAACGA CATGTTTC	3281	GAAACAUG A UGUGAGAU	3991
2081	TAATCTCA GGCTAGCTACAACGA ATCATGTT	3282	AACAUGAU G UGAGAUUA	3992
2086	CAAAGTAA GGCTAGCTACAACGA CTCACATC	3283	GAUGUGAG A UUACUUUG	3993
2089	GGACAAAG GGCTAGCTACAACGA AATCTCAC	3284	GUGAGAUU A CUUUGUCC	3994
2094	AAGCGGGA GGCTAGCTACAACGA AAAGTAAT	3285	AUUACUUU G UCCCGCUU	3995
2099	AGAATAAG GGCTAGCTACAACGA GGGACAAA	3286	UUUGUCCC G CUUAUUCU	3996
2103	GAGCAGAA GGCTAGCTACAACGA AAGCGGGA	3287	UCCCGCUU A UUCUGCUC	3997
2108	ACAGGGAG GGCTAGCTACAACGA AGAATAAG	3288	CUUAUUCU G CUCCCUGU	3998
2115	GCAGATAA GGCTAGCTACAACGA AGGGAGCA	3289	UGCUCCCU G UUAUCUGC	3999
2118	CTAGCAGA GGCTAGCTACAACGA AACAGGGA	3290	UCCCUGUU A UCUGCUAG	4000
2122	AGATCTAG GGCTAGCTACAACGA AGATAACA	3291	UGUUAUCU G CUAGAUCU	4001
2127	GAACTAGA GGCTAGCTACAACGA CTAGCAGA	3292	UCUGCUAG A UCUAGUUC	4002
2132	ATTGAGAA GGCTAGCTACAACGA TAGATCTA	3293	UAGAUCUA G UUCUCAAU	4003
2139	AGCAGTGA GGCTAGCTACAACGA TGAGAACT	3294	AGUUCUCA A UCACUGCU	4004
2142	GGGAGCAG GGCTAGCTACAACGA GATTGAGA	3295	UCUCAAUC A CUGCUCCC	4005
2145	CGGGGGAG GGCTAGCTACAACGA AGTGATTG	3296	CAAUCACU G CUCCCCCG	4006

Table 6

2153	AATACACA GGCTAGCTACAACGA GGGGGAGC	3297	GCUCCCCC G UGUGUAUU	4007
2155	CTAATACA GGCTAGCTACAACGA ACGGGGGA	3298	UCCCCCGU G UGUAUUAG	4008
2157	TTCTAATA GGCTAGCTACAACGA ACACGGGG	3299	CCCCGUGU G UAUUAGAA	4009
2159	CATTCTAA GGCTAGCTACAACGA ACACACGG	3300	CCGUGUGU A UUAGAAUG	4010
2165	TACATGCA GGCTAGCTACAACGA TCTAATAC	3301	GUAUUAGA A UGCAUGUA	4011
2167	CTTACATG GGCTAGCTACAACGA ATTCTAAT	3302	AUUAGAAU G CAUGUAAG	4012
2169	ACCTTACA GGCTAGCTACAACGA GCATTCTA	3303	UAGAAUGC A UGUAAGGU	4013
2171	AGACCTTA GGCTAGCTACAACGA ATGCATTC	3304	GAAUGCAU G UAAGGUCU	4014
2176	CAAGAAGA GGCTAGCTACAACGA CTTACATG	3305	CAUGUAAG G UCUUCUUG	4015
2184	TCAGGACA GGCTAGCTACAACGA AAGAAGAC	3306	GUCUUCUU G UGUCCUGA	4016
2186	CATCAGGA GGCTAGCTACAACGA ACAAGAAG	3307	CUUCUUGU G UCCUGAUG	4017
2192	ATTTTTCA GGCTAGCTACAACGA CAGGACAC	3308	GUGUCCUG A UGAAAAAU	4018
2199	AGCACATA GGCTAGCTACAACGA TTTTCATC	3309	GAUGAAAA A UAUGUGCU	4019
2201	CAAGCACA GGCTAGCTACAACGA ATTTTTCA	3310	UGAAAAAU A UGUGCUUG	4020
2203	TTCAAGCA GGCTAGCTACAACGA ATATTTTT	3311	AAAAAUAU G UGCUUGAA	4021
2205	ATTTCAAG GGCTAGCTACAACGA ACATATTT	3312	AAAUAUGU G CUUGAAAU	4022
2212	GTTTCTCA GGCTAGCTACAACGA TTCAAGCA	3313	UGCUUGAA A UGAGAAAC	4023
2219	GATCAAAG GGCTAGCTACAACGA TTCTCATT	3314	AAUGAGAA A CUUUGAUC	4024
2225	AGCAGAGA GGCTAGCTACAACGA CAAAGTTT	3315	AAACUUUG A UCUCUGCU	4025
2231	TTAGTAAG GGCTAGCTACAACGA AGAGATCA	3316	UGAUCUCU G CUUACUAA	4026
2235	CACATTAG GGCTAGCTACAACGA AAGCAGAG	3317	CUCUGCUU A CUAAUGUG	4027
2239	GGGGCACA GGCTAGCTACAACGA TAGTAAGC	3318	GCUUACUA A UGUGCCCC	4028
2241	ATGGGGCA GGCTAGCTACAACGA ATTAGTAA	3319	UUACUAAU G UGCCCCAU	4029
2243	ACATGGGG GGCTAGCTACAACGA ACATTAGT	3320	ACUAAUGU G CCCCAUGU	4030
2248	CTTGGACA GGCTAGCTACAACGA GGGGCACA	3321	UGUGCCCC A UGUCCAAG	4031
2250	GACTTGGA GGCTAGCTACAACGA ATGGGGCA	3322	UGCCCCAU G UCCAAGUC	4032
2256	AGGTTGGA GGCTAGCTACAACGA TTGGACAT	3323	AUGUCCAA G UCCAACCU	4033
2261	CAGGCAGG GGCTAGCTACAACGA TGGACTTG	3324	CAAGUCCA A CCUGCCUG	4034
2265	TGCACAGG GGCTAGCTACAACGA AGGTTGGA	3325	UCCAACCU G CCUGUGCA	4035
2269	GTCATGCA GGCTAGCTACAACGA AGGCAGGT	3326	ACCUGCCU G UGCAUGAC	4036
2271	AGGTCATG GGCTAGCTACAACGA ACAGGCAG	3327	CUGCCUGU G CAUGACCU	4037

Table 6

2273	TCAGGTCA GGCTAGCTACAACGA GCACAGGC	3328	GCCUGUGC A UGACCUGA	4038
2276	TGATCAGG GGCTAGCTACAACGA CATGCACA	3329	UGUGCAUG A CCUGAUCA	4039
2281	TGTAATGA GGCTAGCTACAACGA CAGGTCAT	3330	AUGACCUG A UCAUUACA	4040
2284	CCATGTAA GGCTAGCTACAACGA GATCAGGT	3331	ACCUGAUC A UUACAUGG	4041
2287	CAGCCATG GGCTAGCTACAACGA AATGATCA	3332	UGAUCAUU A CAUGGCUG	4042
2289	CACAGCCA GGCTAGCTACAACGA GTAATGAT	3333	AUCAUUAC A UGGCUGUG	4043
2292	AACCACAG GGCTAGCTACAACGA CATGTAAT	3334	AUUACAUG G CUGUGGUU	4044
2295	AGGAACCA GGCTAGCTACAACGA AGCCATGT	3335	ACAUGGCU G UGGUUCCU	4045
2298	CTTAGGAA GGCTAGCTACAACGA CACAGCCA	3336	UGGCUGUG G UUCCUAAG	4046
2306	GCAACAGG GGCTAGCTACAACGA TTAGGAAC	3337	GUUCCUAA G CCUGUUGC	4047
2310	TTCAGCAA GGCTAGCTACAACGA AGGCTTAG	3338	CUAAGCCU G UUGCUGAA	4048
2313	GACTTCAG GGCTAGCTACAACGA AACAGGCT	3339	AGCCUGUU G CUGAAGUC	4049
2319	GACAATGA GGCTAGCTACAACGA TTCAGCAA	3340	UUGCUGAA G UCAUUGUC	4050
2322	AGCGACAA GGCTAGCTACAACGA GACTTCAG	3341	CUGAAGUC A UUGUCGCU	4051
2325	CTGAGCGA GGCTAGCTACAACGA AATGACTT	3342	AAGUCAUU G UCGCUCAG	4052
2328	TTGCTGAG GGCTAGCTACAACGA GACAATGA	3343	UCAUUGUC G CUCAGCAA	4053
2333	CCCTATTG GGCTAGCTACAACGA TGAGCGAC	3344	GUCGCUCA G CAAUAGGG	4054
2336	GCACCCTA GGCTAGCTACAACGA TGCTGAGC	3345	GCUCAGCA A UAGGGUGC	4055
2341	AAACTGCA GGCTAGCTACAACGA CCTATTGC	3346	GCAAUAGG G UGCAGUUU	4056
2343	GAAAACTG GGCTAGCTACAACGA ACCCTATT	3347	AAUAGGGU G CAGUUUUC	4057
2346	CTGGAAAA GGCTAGCTACAACGA TGCACCCT	3348	AGGGUGCA G UUUUCCAG	4058
2357	AATGCCTA GGCTAGCTACAACGA TCCTGGAA	3349	UUCCAGGA A UAGGCAUU	4059
2361	GGCAAATG GGCTAGCTACAACGA CTATTCCT	3350	AGGAAUAG G CAUUUGCC	4060
2363	TAGGCAAA GGCTAGCTACAACGA GCCTATTC	3351	GAAUAGGC A UUUGCCUA	4061
2367	GAATTAGG GGCTAGCTACAACGA AAATGCCT	3352	AGGCAUUU G CCUAAUUC	4062
2372	GCCAGGAA GGCTAGCTACAACGA TAGGCAAA	3353	UUUGCCUA A UUCCUGGC	4063
2379	GTGTCATG GGCTAGCTACAACGA CAGGAATT	3354	AAUUCCUG G CAUGACAC	4064
2381	GAGTGTCA GGCTAGCTACAACGA GCCAGGAA	3355	UUCCUGGC A UGACACUC	4065
2384	CTAGAGTG GGCTAGCTACAACGA CATGCCAG	3356	CUGGCAUG A CACUCUAG	4066
2386	CACTAGAG GGCTAGCTACAACGA GTCATGCC	3357	GGCAUGAC A CUCUAGUG	4067
2392	GGAAGTCA GGCTAGCTACAACGA TAGAGTGT	3358	ACACUCUA G UGACUUCC	4068

Table 6

2395	CCAGGAAG GGCTAGCTACAACGA CACTAGAG	3359	CUCUAGUG A CUUCCUGG	4069
2403	GGGCCTCA GGCTAGCTACAACGA CAGGAAGT	3360	ACUUCCUG G UGAGGCCC	4070
2408	AGGCTGGG GGCTAGCTACAACGA CTCACCAG	3361	CUGGUGAG G CCCAGCCU	4071
2413	AGGACAGG GGCTAGCTACAACGA TGGGCCTC	3362	GAGGCCCA G CCUGUCCU	4072
2417	TACCAGGA GGCTAGCTACAACGA AGGCTGGG	3363	CCCAGCCU G UCCUGGUA	4073
2423	CTGCTGTA GGCTAGCTACAACGA CAGGACAG	3364	CUGUCCUG G UACAGCAG	4074
2425	CCCTGCTG GGCTAGCTACAACGA ACCAGGAC	3365	GUCCUGGU A CAGCAGGG	4075
2428	AGACCCTG GGCTAGCTACAACGA TGTACCAG	3366	CUGGUACA G CAGGGUCU	4076
2433	CAGCAAGA GGCTAGCTACAACGA CCTGCTGT	3367	ACAGCAGG G UCUUGCUG	4077
2438	AGTTACAG GGCTAGCTACAACGA AAGACCCT	3368	AGGGUCUU G CUGUAACU	4078
2441	CTGAGTTA GGCTAGCTACAACGA AGCAAGAC	3369	GUCUUGCU G UAACUCAG	4079
2444	TGTCTGAG GGCTAGCTACAACGA TACAGCAA	3370	UUGCUGUA A CUCAGACA	4080
2450	TTGGAATG GGCTAGCTACAACGA CTGAGTTA	3371	UAACUCAG A CAUUCCAA	4081
2452	CCTTGGAA GGCTAGCTACAACGA GTCTGAGT	3372	ACUCAGAC A UUCCAAGG	4082
2461	TTCCCATA GGCTAGCTACAACGA CCTTGGAA	3373	UUCCAAGG G UAUGGGAA	4083
2463	GCTTCCCA GGCTAGCTACAACGA ACCCTTGG	3374	CCAAGGGU A UGGGAAGC	4084
2470	GAATATGG GGCTAGCTACAACGA TTCCCATA	3375	UAUGGGAA G CCAUAUUC	4085
2473	TGTGAATA GGCTAGCTACAACGA GGCTTCCC	3376	GGGAAGCC A UAUUCACA	4086
2475	GGTGTGAA GGCTAGCTACAACGA ATGGCTTC	3377	GAAGCCAU A UUCACACC	4087
2479	GTGAGGTG GGCTAGCTACAACGA GAATATGG	3378	CCAUAUUC A CACCUCAC	4088
2481	GCGTGAGG GGCTAGCTACAACGA GTGAATAT	3379	AUAUUCAC A CCUCACGC	4089
2486	CCAGAGCG GGCTAGCTACAACGA GAGGTGTG	3380	CACACCUC A CGCUCUGG	4090
2488	GTCCAGAG GGCTAGCTACAACGA GTGAGGTG	3381	CACCUCAC G CUCUGGAC	4091
2495	AAATCATG GGCTAGCTACAACGA CCAGAGCG	3382	CGCUCUGG A CAUGAUUU	4092
2497	CTAAATCA GGCTAGCTACAACGA GTCCAGAG	3383	CUCUGGAC A UGAUUUAG	4093
2500	TCCCTAAA GGCTAGCTACAACGA CATGTCCA	3384	UGGACAUG A UUUAGGGA	4094
2510	TGTCCCTG GGCTAGCTACAACGA TTCCCTAA	3385	UUAGGGAA G CAGGGACA	4095
2516	GGGGGGTG GGCTAGCTACAACGA CCCTGCTT	3386	AAGCAGGG A CACCCCCC	4096
2518	GCGGGGGG GGCTAGCTACAACGA GTCCCTGC	3387	GCAGGGAC A CCCCCCGC	4097
2525	GTGGGGGG GGCTAGCTACAACGA GGGGGGTG	3388	CACCCCCC G CCCCCCAC	4098
2532	CCCAAAGG GGCTAGCTACAACGA GGGGGGCG	3389	CGCCCCCC A CCUUUGGG	4099

Table 6

2541	GAGGCTGA GGCTAGCTACAACGA CCCAAAGG	3390	CCUUUGGG A UCAGCCUC	4100
2545	GGCGGAGG GGCTAGCTACAACGA TGATCCCA	3391	UGGGAUCA G CCUCCGCC	4101
2551	TGGAATGG GGCTAGCTACAACGA GGAGGCTG	3392	CAGCCUCC G CCAUUCCA	4102
2554	ACTTGGAA GGCTAGCTACAACGA GGCGGAGG	3393	CCUCCGCC A UUCCAAGU	4103
2561	AGTGTCGA GGCTAGCTACAACGA TTGGAATG	3394	CAUUCCAA G UCGACACU	4104
2565	GAAGAGTG GGCTAGCTACAACGA CGACTTGG	3395	CCAAGUCG A CACUCUUC	4105
2567	AAGAAGAG GGCTAGCTACAACGA GTCGACTT	3396	AAGUCGAC A CUCUUCUU	4106
2578	ACGGTCTG GGCTAGCTACAACGA TCAAGAAG	3397	CUUCUUGA G CAGACCGU	4107
2582	AATCACGG GGCTAGCTACAACGA CTGCTCAA	3398	UUGAGCAG A CCGUGAUU	4108
2585	CCAAATCA GGCTAGCTACAACGA GGTCTGCT	3399	AGCAGACC G UGAUUUGG	4109
2588	CTTCCAAA GGCTAGCTACAACGA CACGGTCT	3400	AGACCGUG A UUUGGAAG	4110
2601	AGCAGGTG GGCTAGCTACAACGA CTCTCTTC	3401	GAAGAGAG G CACCUGCU	4111
2603	CCAGCAGG GGCTAGCTACAACGA GCCTCTCT	3402	AGAGAGGC A CCUGCUGG	4112
2607	GTTTCCAG GGCTAGCTACAACGA AGGTGCCT	3403	AGGCACCU G CUGGAAAC	4113
2614	AAGTGTGG GGCTAGCTACAACGA TTCCAGCA	3404	UGCUGGAA A CCACACUU	4114
2617	AAGAAGTG GGCTAGCTACAACGA GGTTTCCA	3405	UGGAAACC A CACUUCUU	4115
2619	TCAAGAAG GGCTAGCTACAACGA GTGGTTTC	3406	GAAACCAC A CUUCUUGA	4116
2629	CCAGGCTG GGCTAGCTACAACGA TTCAAGAA	3407	UUCUUGAA A CAGCCUGG	4117
2632	CACCCAGG GGCTAGCTACAACGA TGTTTCAA	3408	UUGAAACA G CCUGGGUG	4118
2638	GACCGTCA GGCTAGCTACAACGA CCAGGCTG	3409	CAGCCUGG G UGACGGUC	4119
2641	AAGGACCG GGCTAGCTACAACGA CACCCAGG	3410	CCUGGGUG A CGGUCCUU	4120
2644	CTAAAGGA GGCTAGCTACAACGA CGTCACCC	3411	GGGUGACG G UCCUUUAG	4121
2653	GCAGGCTG GGCTAGCTACAACGA CTAAAGGA	3412	UCCUUUAG G CAGCCUGC	4122
2656	GCGGCAGG GGCTAGCTACAACGA TGCCTAAA	3413	UUUAGGCA G CCUGCCGC	4123
2660	GACGGCGG GGCTAGCTACAACGA AGGCTGCC	3414	GGCAGCCU G CCGCCGUC	4124
2663	AGAGACGG GGCTAGCTACAACGA GGCAGGCT	3415	AGCCUGCC G CCGUCUCU	4125
2666	GACAGAGA GGCTAGCTACAACGA GGCGGCAG	3416	CUGCCGCC G UCUCUGUC	4126
2672	AACCGGGA GGCTAGCTACAACGA AGAGACGG	3417	CCGUCUCU G UCCCGGUU	4127
2678	AAGGTGAA GGCTAGCTACAACGA CGGGACAG	3418	CUGUCCCG G UUCACCUU	4128
2682	CGGCAAGG GGCTAGCTACAACGA GAACCGGG	3419	CCCGGUUC A CCUUGCCG	4129
2687	TCTCTCGG GGCTAGCTACAACGA AAGGTGAA	3420	UUCACCUU G CCGAGAGA	4130

Table 6

2697	CAGACGCG GGCTAGCTACAACGA CTCTCTCG	3421	CGAGAGAG G CGCGUCUG	4131
2699	GGCAGACG GGCTAGCTACAACGA GCCTCTCT	3422	AGAGAGGC G CGUCUGCC	4132
2701	GGGGCAGA GGCTAGCTACAACGA GCGCCTCT	3423	AGAGGCGC G UCUGCCCC	4133
2705	GGGTGGGG GGCTAGCTACAACGA AGACGCGC	3424	GCGCGUCU G CCCCACCC	4134
2710	TTTGAGGG GGCTAGCTACAACGA GGGGCAGA	3425	UCUGCCCC A CCCUCAAA	4135
2718	CCACAGGG GGCTAGCTACAACGA TTGAGGGT	3426	ACCCUCAA A CCCUGUGG	4136
2723	AGGCCCCA GGCTAGCTACAACGA AGGGTTTG	3427	CAAACCCU G UGGGGCCU	4137
2728	CCATCAGG GGCTAGCTACAACGA CCCACAGG	3428	CCUGUGGG G CCUGAUGG	4138
2733	GAGCACCA GGCTAGCTACAACGA CAGGCCCC	3429	GGGGCCUG A UGGUGCUC	4139
2736	CGTGAGCA GGCTAGCTACAACGA CATCAGGC	3430	GCCUGAUG G UGCUCACG	4140
2738	GTCGTGAG GGCTAGCTACAACGA ACCATCAG	3431	CUGAUGGU G CUCACGAC	4141
2742	AAGAGTCG GGCTAGCTACAACGA GAGCACCA	3432	UGGUGCUC A CGACUCUU	4142
2745	AGGAAGAG GGCTAGCTACAACGA CGTGAGCA	3433	UGCUCACG A CUCUUCCU	4143
2754	TCCCTTTG GGCTAGCTACAACGA AGGAAGAG	3434	CUCUUCCU G CAAAGGGA	4144
2763	GTCTTCAG GGCTAGCTACAACGA TCCCTTTG	3435	CAAAGGGA A CUGAAGAC	4145
2770	TGTGGAGG GGCTAGCTACAACGA CTTCAGTT	3436	AACUGAAG A CCUCCACA	4146
2776	ACTTAATG GGCTAGCTACAACGA GGAGGTCT	3437	AGACCUCC A CAUUAAGU	4147
2778	CCACTTAA GGCTAGCTACAACGA GTGGAGGT	3438	ACCUCCAC A UUAAGUGG	4148
2783	AAAAGCCA GGCTAGCTACAACGA TTAATGTG	3439	CACAUUAA G UGGCUUUU	4149
2786	TTAAAAAG GGCTAGCTACAACGA CACTTAAT	3440	AUUAAGUG G CUUUUUAA	4150
2794	TTTTCATG GGCTAGCTACAACGA TAAAAAGC	3441	GCUUUUUA A CAUGAAAA	4151
2796	GTTTTTCA GGCTAGCTACAACGA GTTAAAAA	3442	UUUUUAAC A UGAAAAAC	4152
2803	CTGCCGTG GGCTAGCTACAACGA TTTTCATG	3443	CAUGAAAA A CACGGCAG	4153
2805	AGCTGCCG GGCTAGCTACAACGA GTTTTTCA	3444	UGAAAAAC A CGGCAGCU	4154
2808	TACAGCTG GGCTAGCTACAACGA CGTGTTTT	3445	AAAACACG G CAGCUGUA	4155
2811	AGCTACAG GGCTAGCTACAACGA TGCCGTGT	3446	ACACGGCA G CUGUAGCU	4156
2814	GGGAGCTA GGCTAGCTACAACGA AGCTGCCG	3447	CGGCAGCU G UAGCUCCC	4157
2817	CTCGGGAG GGCTAGCTACAACGA TACAGCTG	3448	CAGCUGUA G CUCCCGAG	4158
2825	GAGAGTAG GGCTAGCTACAACGA TCGGGAGC	3449	GCUCCCGA G CUACUCUC	4159
2828	CAAGAGAG GGCTAGCTACAACGA AGCTCGGG	3450	CCCGAGCU A CUCUCUUG	4160
2836	AATGCTGG GGCTAGCTACAACGA AAGAGAGT	3451	ACUCUCUU G CCAGCAUU	4161

Table 6

2840	TGAAAATG GGCTAGCTACAACGA TGGCAAGA	3452	UCUUGCCA G CAUUUUCA	4162
2842	TGTGAAAA GGCTAGCTACAACGA GCTGGCAA	3453	UUGCCAGC A UUUUCACA	4163
2848	GCAAAATG GGCTAGCTACAACGA GAAAATGC	3454	GCAUUUUC A CAUUUUGC	4164
2850	AGGCAAAA GGCTAGCTACAACGA GTGAAAAT	3455	AUUUUCAC A UUUUGCCU	4165
2855	GAGAAAGG GGCTAGCTACAACGA AAAATGTG	3456	CACAUUUU G CCUUUCUC	4166
2864	TTCTACCA GGCTAGCTACAACGA GAGAAAGG	3457	CCUUUCUC G UGGUAGAA	4167
2867	GGCTTCTA GGCTAGCTACAACGA CACGAGAA	3458	UUCUCGUG G UAGAAGCC	4168
2873	TGTACTGG GGCTAGCTACAACGA TTCTACCA	3459	UGGUAGAA G CCAGUACA	4169
2877	TCTCTGTA GGCTAGCTACAACGA TGGCTTCT	3460	AGAAGCCA G UACAGAGA	4170
2879	TTTCTCTG GGCTAGCTACAACGA ACTGGCTT	3461	AAGCCAGU A CAGAGAAA	4171
2887	CCACAGAA GGCTAGCTACAACGA TTCTCTGT	3462	ACAGAGAA A UUCUGUGG	4172
2892	TCCCACCA GGCTAGCTACAACGA AGAATTTC	3463	GAAAUUCU G UGGUGGGA	4173
2895	TGTTCCCA GGCTAGCTACAACGA CACAGAAT	3464	AUUCUGUG G UGGGAACA	4174
2901	CTCGAATG GGCTAGCTACAACGA TCCCACCA	3465	UGGUGGGA A CAUUCGAG	4175
2903	ACCTCGAA GGCTAGCTACAACGA GTTCCCAC	3466	GUGGGAAC A UUCGAGGU	4176
2910	GGGTGACA GGCTAGCTACAACGA CTCGAATG	3467	CAUUCGAG G UGUCACCC	4177
2912	CAGGGTGA GGCTAGCTACAACGA ACCTCGAA	3468	UUCGAGGU G UCACCCUG	4178
2915	CTGCAGGG GGCTAGCTACAACGA GACACCTC	3469	GAGGUGUC A CCCUGCAG	4179
2920	TAGCTCTG GGCTAGCTACAACGA AGGGTGAC	3470	GUCACCCU G CAGAGCUA	4180
2925	CACCATAG GGCTAGCTACAACGA TCTGCAGG	3471	CCUGCAGA G CUAUGGUG	4181
2928	CCTCACCA GGCTAGCTACAACGA AGCTCTGC	3472	GCAGAGCU A UGGUGAGG	4182
2931	ACACCTCA GGCTAGCTACAACGA CATAGCTC	3473	GAGCUAUG G UGAGGUGU	4183
2936	TATCCACA GGCTAGCTACAACGA CTCACCAT	3474	AUGGUGAG G UGUGGAUA	4184
2938	CTTATCCA GGCTAGCTACAACGA ACCTCACC	3475	GGUGAGGU G UGGAUAAG	4185
2942	AAGCCTTA GGCTAGCTACAACGA CCACACCT	3476	AGGUGUGG A UAAGGCUU	4186
2947	CACCTAAG GGCTAGCTACAACGA CTTATCCA	3477	UGGAUAAG G CUUAGGUG	4187
2953	GCCTGGCA GGCTAGCTACAACGA CTAAGCCT	3478	AGGCUUAG G UGCCAGGC	4188
2955	CAGCCTGG GGCTAGCTACAACGA ACCTAAGC	3479	GCUUAGGU G CCAGGCUG	4189
2960	GCTTACAG GGCTAGCTACAACGA CTGGCACC	3480	GGUGCCAG G CUGUAAGC	4190
2963	AATGCTTA GGCTAGCTACAACGA AGCCTGGC	3481	GCCAGGCU G UAAGCAUU	4191
2967	TCAGAATG GGCTAGCTACAACGA TTACAGCC	3482	GGCUGUAA G CAUUCUGA	4192

Table 6

2969	GCTCAGAA GGCTAGCTACAACGA GCTTACAG	3483	CUGUAAGC A UUCUGAGC	4193
2976	CAAGCCAG GGCTAGCTACAACGA TCAGAATG	3484	CAUUCUGA G CUGGCUUG	4194
2980	ACAACAAG GGCTAGCTACAACGA CAGCTCAG	3485	CUGAGCUG G CUUGUUGU	4195
2984	AAAAACAA GGCTAGCTACAACGA AAGCCAGC	3486	GCUGGCUU G UUGUUUUU	4196
2987	CTTAAAAA GGCTAGCTACAACGA AACAAGCC	3487	GGCUUGUU G UUUUUAAG	4197
2995	ATACAGGA GGCTAGCTACAACGA TTAAAAAC	3488	GUUUUUAA G UCCUGUAU	4198
3000	TACATATA GGCTAGCTACAACGA AGGACTTA	3489	UAAGUCCU G UAUAUGUA	4199
3002	CATACATA GGCTAGCTACAACGA ACAGGACT	3490	AGUCCUGU A UAUGUAUG	4200
3004	TACATACA GGCTAGCTACAACGA ATACAGGA	3491	UCCUGUAU A UGUAUGUA	4201
3006	ACTACATA GGCTAGCTACAACGA ATATACAG	3492	CUGUAUAU G UAUGUAGU	4202
3008	CTACTACA GGCTAGCTACAACGA ACATATAC	3493	GUAUAUGU A UGUAGUAG	4203
3010	AACTACTA GGCTAGCTACAACGA ATACATAT	3494	AUAUGUAU G UAGUAGUU	4204
3013	CCAAACTA GGCTAGCTACAACGA TACATACA	3495	UGUAUGUA G UAGUUUGG	4205
3016	CACCCAAA GGCTAGCTACAACGA TACTACAT	3496	AUGUAGUA G UUUGGGUG	4206
3022	TATACACA GGCTAGCTACAACGA CCAAACTA	3497	UAGUUUGG G UGUGUAUA	4207
3024	TATATACA GGCTAGCTACAACGA ACCCAAAC	3498	GUUUGGGU G UGUAUAUA	4208
3026	TATATATA GGCTAGCTACAACGA ACACCCAA	3499	UUGGGUGU G UAUAUAUA	4209
3028	ACTATATA GGCTAGCTACAACGA ACACACCC	3500	GGGUGUGU A UAUAUAGU	4210
3030	CTACTATA GGCTAGCTACAACGA ATACACAC	3501	GUGUGUAU A UAUAGUAG	4211
3032	TGCTACTA GGCTAGCTACAACGA ATATACAC	3502	GUGUAUAU A UAGUAGCA	4212
3035	AAATGCTA GGCTAGCTACAACGA TATATATA	3503	UAUAUAUA G UAGCAUUU	4213
3038	TTGAAATG GGCTAGCTACAACGA TACTATAT	3504	AUAUAGUA G CAUUUCAA	4214
3040	TTTTGAAA GGCTAGCTACAACGA GCTACTAT	3505	AUAGUAGC A UUUCAAAA	4215
3048	TACGTCCA GGCTAGCTACAACGA TTTGAAAT	3506	AUUUCAAA A UGGACGUA	4216
3052	CCAGTACG GGCTAGCTACAACGA CCATTTTG	3507	CAAAAUGG A CGUACUGG	4217
3054	AACCAGTA GGCTAGCTACAACGA GTCCATTT	3508	AAAUGGAC G UACUGGUU	4218
3056	TAAACCAG GGCTAGCTACAACGA ACGTCCAT	3509	AUGGACGU A CUGGUUUA	4219
3060	AGGTTAAA GGCTAGCTACAACGA CAGTACGT	3510	ACGUACUG G UUUAACCU	4220
3065	ATAGGAGG GGCTAGCTACAACGA TAAACCAG	3511	CUGGUUUA A CCUCCUAU	4221
3072	TCCAAGGA GGCTAGCTACAACGA AGGAGGTT	3512	AACCUCCU A UCCUUGGA	4222
3083	GCCAGCTG GGCTAGCTACAACGA TCTCCAAG	3513	CUUGGAGA G CAGCUGGC	4223

Table 6

3086	AGAGCCAG GGCTAGCTACAACGA TGCTCTCC	3514	GGAGAGCA G CUGGCUCU	4224
3090	GTGGAGAG GGCTAGCTACAACGA CAGCTGCT	3515	AGCAGCUG G CUCUCCAC	4225
3097	TAACAAGG GGCTAGCTACAACGA GGAGAGCC	3516	GGCUCUCC A CCUUGUUA	4226
3102	ATGTGTAA GGCTAGCTACAACGA AAGGTGGA	3517	UCCACCUU G UUACACAU	4227
3105	ATAATGTG GGCTAGCTACAACGA AACAAGGT	3518	ACCUUGUU A CACAUUAU	4228
3107	ACATAATG GGCTAGCTACAACGA GTAACAAG	3519	CUUGUUAC A CAUUAUGU	4229
3109	TAACATAA GGCTAGCTACAACGA GTGTAACA	3520	UGUUACAC A UUAUGUUA	4230
3112	CTCTAACA GGCTAGCTACAACGA AATGTGTA	3521	UACACAUU A UGUUAGAG	4231
3114	CTCTCTAA GGCTAGCTACAACGA ATAATGTG	3522	CACAUUAU G UUAGAGAG	4232
3123	GCTCGCTA GGCTAGCTACAACGA CTCTCTAA	3523	UUAGAGAG G UAGCGAGC	4233
3126	GCAGCTCG GGCTAGCTACAACGA TACCTCTC	3524	GAGAGGUA G CGAGCUGC	4234
3130	CAGAGCAG GGCTAGCTACAACGA TCGCTACC	3525	GGUAGCGA G CUGCUCUG	4235
3133	TAGCAGAG GGCTAGCTACAACGA AGCTCGCT	3526	AGCGAGCU G CUCUGCUA	4236
3138	GGACATAG GGCTAGCTACAACGA AGAGCAGC	3527	GCUGCUCU G CUAUGUCC	4237
3141	TAAGGACA GGCTAGCTACAACGA AGCAGAGC	3528	GCUCUGCU A UGUCCUUA	4238
3143	CTTAAGGA GGCTAGCTACAACGA ATAGCAGA	3529	UCUGCUAU G UCCUUAAG	4239
3151	AATATTGG GGCTAGCTACAACGA TTAAGGAC	3530	GUCCUUAA G CCAAUAUU	4240
3155	AGTAAATA GGCTAGCTACAACGA TGGCTTAA	3531	UUAAGCCA A UAUUUACU	4241
3157	TGAGTAAA GGCTAGCTACAACGA ATTGGCTT	3532	AAGCCAAU A UUUACUCA	4242
3161	CTGATGAG GGCTAGCTACAACGA AAATATTG	3533	CAAUAUUU A CUCAUCAG	4243
3165	TGACCTGA GGCTAGCTACAACGA GAGTAAAT	3534	AUUUACUC A UCAGGUCA	4244
3170	AATAATGA GGCTAGCTACAACGA CTGATGAG	3535	CUCAUCAG G UCAUUAUU	4245
3173	AAAAATAA GGCTAGCTACAACGA GACCTGAT	3536	AUCAGGUC A UUAUUUUU	4246
3176	GTAAAAAA GGCTAGCTACAACGA AATGACCT	3537	AGGUCAUU A UUUUUUAC	4247
3183	GGCCATTG GGCTAGCTACAACGA AAAAAATA	3538	UAUUUUUU A CAAUGGCC	4248
3186	CATGGCCA GGCTAGCTACAACGA TGTAAAAA	3539	UUUUUACA A UGGCCAUG	4249
3189	TTCCATGG GGCTAGCTACAACGA CATTGTAA	3540	UUACAAUG G CCAUGGAA	4250
3192	TTATTCCA GGCTAGCTACAACGA GGCCATTG	3541	CAAUGGCC A UGGAAUAA	4251
3197	ATGGTTTA GGCTAGCTACAACGA TCCATGGC	3542	GCCAUGGA A UAAACCAU	4252
3201	AAAAATGG GGCTAGCTACAACGA TTATTCCA	3543	UGGAAUAA A CCAUUUUU	4253
3204	TGTAAAAA GGCTAGCTACAACGA GGTTTATT	3544	AAUAAACC A UUUUUACA	4254

Table 7

Table 7: Human PTP-1B Hairpin Ribozyme and Target Sequence

Nt. Position	Ribozyme sequence	Seq. ID Nos.	Substrate Sequence	Seq. ID Nos.
10	GCUCUA AGAA GCGU ACCAGAGAAACA X GUACAUUACCUGGUA	4255	ACGC GGCC TAGAGC	4331
23	UGCGCC AGAA GCCG ACCAGAGAAACA X GUACAUUACCUGGUA	4256	CGGC AGAC GGCGCA	4332
56	CAGGGC AGAA GCUG ACCAGAGAAACA X GUACAUUACCUGGUA	4257	CAGC AGCC GCCCTG	4333
59	GGCCAG AGAA GCUG ACCAGAGAAACA X GUACAUUACCUGGUA	4258	CAGC CGCC CTGGCC	4334
98	UUGUCG AGAA GCUC ACCAGAGAAACA X GUACAUUACCUGGUA	4259	GAGC AGAT CGACAA	4335
220	CAAAGG AGAA GACG ACCAGAGAAACA X GUACAUUACCUGGUA	4260	CGTC AGTC CCTTTG	4336
239	AGUUUA AGAA GACU ACCAGAGAAACA X GUACAUUACCUGGUA	4261	AGTC GGAT TAAACT	4337
612	UCCAAA AGAA GGCC ACCAGAGAAACA X GUACAUUACCUGGUA	4262	GGCC TGAC TTTGGA	4338
636	GAAUGA AGAA GGUG ACCAGAGAAACA X GUACAUUACCUGGUA	4263	CACC AGCC TCATTC	4339
685	GCUCCG AGAA GAGU ACCAGAGAAACA X GUACAUUACCUGGUA	4264	ACTC AGCC CGGAGC	4340
702	CACCAC AGAA GGCC ACCAGAGAAACA X GUACAUUACCUGGUA	4265	GGCC CGTT GTGGTG	4341
748	CAGCCA AGAA GAAG ACCAGAGAAACA X GUACAUUACCUGGUA	4266	CTTC TGTC TGGCTG	4342
763	GCAAGA AGAA GGUA ACCAGAGAAACA X GUACAUUACCUGGUA	4267	TACC TGCC TCTTGC	4343
773	UUGUCC AGAA GCAA ACCAGAGAAACA X GUACAUUACCUGGUA	4268	TTGC TGAT GGACAA	4344
801	GAUAUC AGAA GAAG ACCAGAGAAACA X GUACAUUACCUGGUA	4269	CTTC CGTT GATATC	4345
842	AGCCCC AGAA GAAA ACCAGAGAAACA X GUACAUUACCUGGUA	4270	TTTC GGAT GGGGCT	4346
851	GUCUGG AGAA GCCC ACCAGAGAAACA X GUACAUUACCUGGUA	4271	GGGC TGAT CCAGAC	4347
861	CUGGUC AGAA GUCU ACCAGAGAAACA X GUACAUUACCUGGUA	4272	AGAC AGCC GACCAG	4348
864	CAGCUG AGAA GCUG ACCAGAGAAACA X GUACAUUACCUGGUA	4273	CAGC CGAC CAGCTG	4349
869	AAGCGC AGAA GGUC ACCAGAGAAACA X GUACAUUACCUGGUA	4274	GACC AGCT GCGCTT	4350
1102	UGAUGG AGAA GUCU ACCAGAGAAACA X GUACAUUACCUGGUA	4275	AGAC TGCC CCATCA	4351
1224	UGGGGA AGAA GCCU ACCAGAGAAACA X GUACAUUACCUGGUA	4276	AGGC TGCC TCCCCA	4352
1253	UUCUCG AGAA GUGA ACCAGAGAAACA X GUACAUUACCUGGUA	4277	TCAC TGCC CGAGAA	4353
1323	CGUGAG AGAA GUAG ACCAGAGAAACA X GUACAUUACCUGGUA	4278	CTAC GGTC CTCACG	4354
1332	AGCGCC AGAA GUGA ACCAGAGAAACA X GUACAUUACCUGGUA	4279	TCAC GGCC GGCGCT	4355
1361	CUGUUG AGAA GGAA ACCAGAGAAACA X GUACAUUACCUGGUA	4280	TTCC TGTT CAACAG	4356
1383	AGGAGG AGAA GGCU ACCAGAGAAACA X GUACAUUACCUGGUA	4281	AGCC TGAC CCTCCT	4357
1412	GAGGCG AGAA GUGG ACCAGAGAAACA X GUACAUUACCUGGUA	4282	CCAC TGTC CGCCTC	4358

Table 7

1416	GGCAGA AGAA GACA ACCAGAGAAACA X GUACAUUACCUGGUA	4283	TGTC CGCC TCTGCC	4359
1422	UCUGCG AGAA GAGG ACCAGAGAAACA X GUACAUUACCUGGUA	4284	CCTC TGCC CGCAGA	4360
1441	CUGCUA AGAA GGCG ACCAGAGAAACA X GUACAUUACCUGGUA	4285	CGCC CGAC TAGCAG	4361
1460	CUUACC AGAA GCGG ACCAGAGAAACA X GUACAUUACCUGGUA	4286	CCGC GGTA GGTAAG	4362
1473	CGGUCC AGAA GCCC ACCAGAGAAACA X GUACAUUACCUGGUA	4287	GGGC CGCC GGACCG	4363
1477	UACGCG AGAA GGCG ACCAGAGAAACA X GUACAUUACCUGGUA	4288	CGCC GGAC CGCGTA	4364
1501	ACGUCC AGAA GGGG ACCAGAGAAACA X GUACAUUACCUGGUA	4289	CCCC GGAC GGACGT	4365
1505	ACCAAC AGAA GUCC ACCAGAGAAACA X GUACAUUACCUGGUA	4290	GGAC GGAC GTTGGT	4366
1539	ACACAC AGAA GGGG ACCAGAGAAACA X GUACAUUACCUGGUA	4291	CCCC GGAT GTGTGT	4367
1670	CCCCAA AGAA GGUG ACCAGAGAAACA X GUACAUUACCUGGUA	4292	CACC CGTC TTGGGG	4368
1735	GGGGGG AGAA GUCU ACCAGAGAAACA X GUACAUUACCUGGUA	4293	AGAC AGCC CCCCCC	4369
1864	AUGCAA AGAA GACA ACCAGAGAAACA X GUACAUUACCUGGUA	4294	TGTC AGCC TTGCAT	4370
1946	UGACGC AGAA GGCC ACCAGAGAAACA X GUACAUUACCUGGUA	4295	GGCC TGCT GCGTCA	4371
1955	GUACUG AGAA GACG ACCAGAGAAACA X GUACAUUACCUGGUA	4296	CGTC AGAC CAGTAC	4372
1960	UCCCAG AGAA GGUC ACCAGAGAAACA X GUACAUUACCUGGUA	4297	GACC AGTA CTGGGA	4373
1978	GCUUAC AGAA GUCC ACCAGAGAAACA X GUACAUUACCUGGUA	4298	GGAC GGTT GTAAGC	4374
1988	AAUAAC AGAA GCUU ACCAGAGAAACA X GUACAUUACCUGGUA	4299	AAGC AGTT GTTATT	4375
2098	AGAAUA AGAA GGAC ACCAGAGAAACA X GUACAUUACCUGGUA	4300	GTCC CGCT TATTCT	4376
2107	ACAGGG AGAA GAAU ACCAGAGAAACA X GUACAUUACCUGGUA	4301	ATTC TGCT CCCTGT	4377
2144	CGGGGG AGAA GUGA ACCAGAGAAACA X GUACAUUACCUGGUA	4302	TCAC TGCT CCCCCG	4378
2190	UUUUUC AGAA GGAC ACCAGAGAAACA X GUACAUUACCUGGUA	4303	GTCC TGAT GAAAAA	4379
2230	UUAGUA AGAA GAGA ACCAGAGAAACA X GUACAUUACCUGGUA	4304	TCTC TGCT TACTAA	4380
2264	UGCACA AGAA GGUU ACCAGAGAAACA X GUACAUUACCUGGUA	4305	AACC TGCC TGTGCA	4381
2279	GUAAUG AGAA GGUC ACCAGAGAAACA X GUACAUUACCUGGUA	4306	GACC TGAT CATTAC	4382
2309	UUCAGC AGAA GGCU ACCAGAGAAACA X GUACAUUACCUGGUA	4307	AGCC TGTT GCTGAA	4383
2345	CUGGAA AGAA GCAC ACCAGAGAAACA X GUACAUUACCUGGUA	4308	GTGC AGTT TTCCAG	4384
2412	AGGACA AGAA GGGC ACCAGAGAAACA X GUACAUUACCUGGUA	4309	GCCC AGCC TGTCCT	4385
2416	UACCAG AGAA GGCU ACCAGAGAAACA X GUACAUUACCUGGUA	4310	AGCC TGTC CTGGTA	4386
2524	GUGGGG AGAA GGGG ACCAGAGAAACA X GUACAUUACCUGGUA	4311	CCCC CGCC CCCCAC	4387
2544	GGCGGA AGAA GAUC ACCAGAGAAACA X GUACAUUACCUGGUA	4312	GATC AGCC TCCGCC	4388
2580	AUCACG AGAA GCUC ACCAGAGAAACA X GUACAUUACCUGGUA	4313	GAGC AGAC CGTGAT	4389

Table 7

2606	GUUUCC AGAA GGUG ACCAGAGAAACA X GUACAUUACCUGGUA	4314	CACC TGCT GGAAAC	4390
2631	CACCCA AGAA GUUU ACCAGAGAAACA X GUACAUUACCUGGUA	4315	AAAC AGCC TGGGTG	4391
2643	CUAAAG AGAA GUCA ACCAGAGAAACA X GUACAUUACCUGGUA	4316	TGAC GGTC CTTTAG	4392
2655	GCGGCA AGAA GCCU ACCAGAGAAACA X GUACAUUACCUGGUA	4317	AGGC AGCC TGCCGC	4393
2659	GACGGC AGAA GGCU ACCAGAGAAACA X GUACAUUACCUGGUA	4318	AGCC TGCC GCCGTC	4394
2662	AGAGAC AGAA GCAG ACCAGAGAAACA X GUACAUUACCUGGUA	4319	CTGC CGCC GTCTCT	4395
2665	GACAGA AGAA GCGG ACCAGAGAAACA X GUACAUUACCUGGUA	4320	CCGC CGTC TCTGTC	4396
2671	AACCGG AGAA GAGA ACCAGAGAAACA X GUACAUUACCUGGUA	4321	TCTC TGTC CCGGTT	4397
2677	AAGGUG AGAA GGGA ACCAGAGAAACA X GUACAUUACCUGGUA	4322	TCCC GGTT CACCTT	4398
2704	GGGUGG AGAA GACG ACCAGAGAAACA X GUACAUUACCUGGUA	4323	CGTC TGCC CCACCC	4399
2731	AGCACC AGAA GGCC ACCAGAGAAACA X GUACAUUACCUGGUA	4324	GGCC TGAT GGTGCT	4400
2810	AGCUAC AGAA GCCG ACCAGAGAAACA X GUACAUUACCUGGUA	4325	CGGC AGCT GTAGCT	4401
2813	GGGAGC AGAA GCUG ACCAGAGAAACA X GUACAUUACCUGGUA	4326	CAGC TGTA GCTCCC	4402
2876	UCUCUG AGAA GGCU ACCAGAGAAACA X GUACAUUACCUGGUA	4327	AGCC AGTA CAGAGA	4403
2999	UACAUA AGAA GGAC ACCAGAGAAACA X GUACAUUACCUGGUA	4328	GTCC TGTA TATGTA	4404
3085	AGAGCC AGAA GCUC ACCAGAGAAACA X GUACAUUACCUGGUA	4329	GAGC AGCT GGCTCT	4405
3132	UAGCAG AGAA GCUC ACCAGAGAAACA X GUACAUUACCUGGUA	4330	GAGC TGCT CTGCTA	4406

Table 8

Table 8: Anti Human PTP-1B HH, NCH, and G Cleaver Ribozymes

Alias	Ribozyme Sequence	Seq. ID Nos	Substrate Seq.	Seq. ID Nos.
HH				
PTP1B-599	UGUGGUA CUGAUGAGGCCGUUAGGCCGAA AGUGGAA	4407	UUCCACU A UACCACA	4425
PTP1B-879	GGUAGGA CUGAUGAGGCCGUUAGGCCGAA AAGCGCA	4408	UGCGCUU C UCCUACC	4426
PTP1B-1393	UGGAGUG CUGAUGAGGCCGUUAGGCCGAA AGGAGGG	4409	CCCUCCU C CACUCCA	4427
PTP1B-1398	GGAGGUG CUGAUGAGGCCGUUAGGCCGAA AGUGGAG	4410	CUCCACU C CACCUCC	4428
PTP1B-1404	GUGGGUG CUGAUGAGGCCGUUAGGCCGAA AGGUGGA	4411	UCCACCU C CACCCAC	4429
PTP1B-2118	UAGCAGA CUGAUGAGGCCGUUAGGCCGAA AACAGGG	4412	CCCUGUU A UCUGCUA	4430
PTP1B-2181	GACACAA CUGAUGAGGCCGUUAGGCCGAA AAGACCU	4413	AGGUCUU C UUGUGUC	4431
PTP1B-2183	AGGACAC CUGAUGAGGCCGUUAGGCCGAA AGAAGAC	4414	GUCUUCU U GUGUCCU	4432
PTP1B-2238	GGCACAU CUGAUGAGGCCGUUAGGCCGAA AGUAAGC	4415	GCUUACU A AUGUGCC	4433
PTP1B-2252	GGACUUG CUGAUGAGGCCGUUAGGCCGAA ACAUGGG	4416	CCCAUGU C CAAGUCC	4434
NCH				
PTP1B-1395	GGUGGAG CUGAUGAGGCCGUUAGGCCGAA IGAGGAG	4417	CUCCUCC A CUCCACC	4435
PTP1B-1408	GACAGUG CUGAUGAGGCCGUUAGGCCGAA IUGGAGG	4418	CCUCCAC C CACUGUC	4436
PTP1B-1555	GGAUGAG CUGAUGAGGCCGUUAGGCCGAA IGUGAGA	4419	UCUCACC C CUCAUCC	4437
PTP1B-1578	AGUGGAA CUGAUGAGGCCGUUAGGCCGAA IGGCAAA	4420	UUUGCCC C UUCCACU	4438
PTP1B-2113	GAUAACA CUGAUGAGGCCGUUAGGCCGAA IGAGCAG	4421	CUGCUCC C UGUUAUC	4439
G-Cleaver				
PTP1B-1267	GUCCU UGAUGGCAUGCACUAUGCGCG GUCCUUCUCG	4422	CGAGAAGGAC G AGGAC	4440
PTP1B-2184	GGACA UGAUGGCAUGCACUAUGCGCG AAGAAGACCU	4423	AGGUCUUCUU G UGUCC	4441
PTP1B-2241	GGGCA UGAUGGCAUGCACUAUGCGCG AUUAGUAAGC	4424	GCUUACUAAU G UGCCC	4442

Table 9

Table 9: Human methionine aminopeptidase type 2 (Met AP-2) Hammerhead Ribozyme and Target Sequence

Nt. position	Ribozyme Sequence	Seq ID nos.	Substrate Sequence	Seq ID nos.
9	CCGAGAGA CUGAUGAG X CGAA ACGAGGGA	1	TCCCTCGT C TCTCTCGG	413
11	GCCCGAGA CUGAUGAG X CGAA AGACGAGG	2	CCTCGTCT C TCTCGGGC	414
13	UUGCCCGA CUGAUGAG X CGAA AGAGACGA	3	TCGTCTCT C TCGGGCAA	415
15	UGUUGCCC CUGAUGAG X CGAA AGAGAGAC	4	GTCTCTCT C GGGCAACA	416
43	GAGGCCGC CUGAUGAG X CGAA ACCUCCUC	5	GAGGAGGT A GCGGCCTC	417
51	GGCUCCCG CUGAUGAG X CGAA AGGCCGCU	6	AGCGGCCT C CGGGAGCC	418
80	GUCGUCUG CUGAUGAG X CGAA AUCCAGGU	7	ACCTGGAT C CAGACGAC	419
108	CAGCCGUA CUGAUGAG X CGAA AGGCAGCU	8	AGCTGCCT C TACGGCTG	420
110	CUCAGCCG CUGAUGAG X CGAA AGAGGCAG	9	CTGCCTCT A CGGCTGAG	421
167	UGCUGCAG CUGAUGAG X CGAA AGGCCCUU	10	AAGGGCCT T CTGCAGCA	422
168	CUGCUGCA CUGAUGAG X CGAA AAGGCCCU	11	AGGGCCTT C TGCAGCAG	423
194	UGAUUCUU CUGAUGAG X CGAA AUCAGGUU	12	AACCTGAT A AAGAATCA	424
201	AGGCUCCU CUGAUGAG X CGAA AUUCUUUA	13	TAAAGAAT C AGGAGCCT	425
210	CAUCCACU CUGAUGAG X CGAA AGGCUCCU	14	AGGAGCCT C AGTGGATG	426
223	UGUCUUGC CUGAUGAG X CGAA ACUUCAUC	15	GATGAAGT A GCAAGACA	427
234	AUCUUUCC CUGAUGAG X CGAA ACUGUCUU	16	AAGACAGT T GGAAAGAT	428
243	CCAAUGCU CUGAUGAG X CGAA AUCUUUCC	17	GGAAAGAT C AGCATTGG	429
249	UAUCUUCC CUGAUGAG X CGAA AUGCUGAU	18	ATCAGCAT T GGAAGATA	430
257	UCUUUCUU CUGAUGAG X CGAA AUCUUCCA	19	TGGAAGAT A AAGAAAGA	431
355	UCUGUUUG CUGAUGAG X CGAA ACUUUUGG	20	CCAAAAGT T CAAACAGA	432
356	GUCUGUUU CUGAUGAG X CGAA AACUUUUG	21	CAAAAGTT C AAACAGAC	433
368	AACUGAGG CUGAUGAG X CGAA AGGGUCUG	22	CAGACCCT C CCTCAGTT	434
372	UUGGAACU CUGAUGAG X CGAA AGGGAGGG	23	CCCTCCCT C AGTTCCAA	435
376	CAUAUUGG CUGAUGAG X CGAA ACUGAGGG	24	CCCTCAGT T CCAATATG	436
377	ACAUAUUG CUGAUGAG X CGAA AACUGAGG	25	CCTCAGTT C CAATATGT	437
382	AGGUCACA CUGAUGAG X CGAA AUUGGAAC	26	GTTCCAAT A TGTGACCT	438
393	CAUUAGGA CUGAUGAG X CGAA ACAGGUCA	27	TGACCTGT A TCCTAATG	439
395	ACCAUUAG CUGAUGAG X CGAA AUACAGGU	28	ACCTGTAT C CTAATGGT	440
398	UACACCAU CUGAUGAG X CGAA AGGAUACA	29	TGTATCCT A ATGGTGTA	441
406	UUGGGAAA CUGAUGAG X CGAA ACACCAUU	30	AATGGTGT A TTTCCCAA	442
408	CUUUGGGA CUGAUGAG X CGAA AUACACCA	31	TGGTGTAT T TCCCAAAG	443
409	CCUUUGGG CUGAUGAG X CGAA AAUACACC	32	GGTGTATT T CCCAAAGG	444
410	UCCUUUGG CUGAUGAG X CGAA AAAUACAC	33	GTGTATTT C CCAAAGGA	445
432	UGGGUGGG CUGAUGAG X CGAA AUUCGCAU	34	ATGCGAAT A CCCACCCA	446
464	AGUUCUCC CUGAUGAG X CGAA AGCAGCUG	35	CAGCTGCT T GGAGAACT	447
473	UUCACUUG CUGAUGAG X CGAA AGUUCUCC	36	GGAGAACT A CAAGTGAA	448
495	CCUGAUCU CUGAUGAG X CGAA AUGCUUUC	37	GAAAGCAT T AGATCAGG	449
496	GCCUGAUC CUGAUGAG X CGAA AAUGCUUU	38	AAAGCATT A GATCAGGC	450
500	ACUUGCCU CUGAUGAG X CGAA AUCUAAUG	39	CATTAGAT C AGGCAAGT	451
517	UCAUUCCA CUGAUGAG X CGAA AUCUCUUC	40	GAAGAGAT T TGGAATGA	452
518	AUCAUUCC CUGAUGAG X CGAA AAUCUCUU	41	AAGAGATT T GGAATGAT	453
527	UUCUCGAA CUGAUGAG X CGAA AUCAUUCC	42	GGAATGAT T TTCGAGAA	454

Table 9

528	CUUCUCGA CUGAUGAG X CGAA AAUCAUUC	43	GAATGATT T TCGAGAAG	455
529	GCUUCUCG CUGAUGAG X CGAA AAAUCAUU	44	AATGATTT T CGAGAAGC	456
530	AGCUUCUC CUGAUGAG X CGAA AAAAUCAU	45	ATGATTTT C GAGAAGCT	457
551	AACUUGUC CUGAUGAG X CGAA AUGUGCUU	46	AAGCACAT C GACAAGTT	458
559	UAUUUUCU CUGAUGAG X CGAA ACUUGUCG	47	CGACAAGT T AGAAAATA	459
560	GUAUUUUC CUGAUGAG X CGAA AACUUGUC	48	GACAAGTT A GAAAATAC	460
567	UCAUUACG CUGAUGAG X CGAA AUUUUCUA	49	TAGAAAAT A CGTAATGA	461
571	CAGCUCAU CUGAUGAG X CGAA ACGUAUUU	50	AAATACGT A ATGAGCTG	462
583	CCAGGCUU CUGAUGAG X CGAA AUCCAGCU	51	AGCTGGAT C AAGCCTGG	463
604	CAGAUUUC CUGAUGAG X CGAA AUCAUUGU	52	ACAATGAT A GAAATCTG	464
610	UUUUCACA CUGAUGAG X CGAA AUUUCUAU	53	ATAGAAAT C TGTGAAAA	465
621	AGUCUUCC CUGAUGAG X CGAA ACUUUUCA	54	TGAAAAGT T GGAAGACT	466
632	CUUGCGUG CUGAUGAG X CGAA ACAGUCUU	55	AAGACTGT T CACGCAAG	467
633	ACUUGCGU CUGAUGAG X CGAA AACAGUCU	56	AGACTGTT C ACGCAAGT	468
642	CUUUUAUU CUGAUGAG X CGAA ACUUGCGU	57	ACGCAAGT T AATAAAAG	469
643	UCUUUUAU CUGAUGAG X CGAA AACUUGCG	58	CGCAAGTT A ATAAAAGA	470
646	UUCUCUUU CUGAUGAG X CGAA AUUAACUU	59	AAGTTAAT A AAAGAGAA	471
660	CUGCAUUU CUGAUGAG X CGAA AUCCAUUC	60	GAATGGAT T AAATGCAG	472
661	CCUGCAUU CUGAUGAG X CGAA AAUCCAUU	61	AATGGATT A AATGCAGG	473
678	CAGUAGGA CUGAUGAG X CGAA AUGCCAGG	62	CCTGGCAT T TCCTACTG	474
679	CCAGUAGG CUGAUGAG X CGAA AAUGCCAG	63	CTGGCATT T CCTACTGG	475
680	UCCAGUAG CUGAUGAG X CGAA AAAUGCCA	64	TGGCATTT C CTACTGGA	476
683	ACAUCCAG CUGAUGAG X CGAA AGGAAAUG	65	CATTTCCT A CTGGATGT	477
692	AUUGAGAG CUGAUGAG X CGAA ACAUCCAG	66	CTGGATGT T CTCTCAAT	478
693	UAUUGAGA CUGAUGAG X CGAA AACAUCCA	67	TGGATGTT C TCTCAATA	479
695	AUUAUUGA CUGAUGAG X CGAA AGAACAUC	68	GATGTTCT C TCAATAAT	480
697	CAAUUAUU CUGAUGAG X CGAA AGAGAACA	69	TGTTCTCT C AATAATTG	481
701	AGCACAAU CUGAUGAG X CGAA AUUGAGAG	70	CTCTCAAT A ATTGTGCT	482
704	GGCAGCAC CUGAUGAG X CGAA AUUAUUGA	71	TCAATAAT T GTGCTGCC	483
716	GGGAGUAU CUGAUGAG X CGAA AUGGGCAG	72	CTGCCCAT T ATACTCCC	484
717	UGGGAGUA CUGAUGAG X CGAA AAUGGGCA	73	TGCCCATT A TACTCCCA	485
719	AUUGGGAG CUGAUGAG X CGAA AUAAUGGG	74	CCCATTAT A CTCCCAAT	486
722	GGCAUUGG CUGAUGAG X CGAA AGUAUAAU	75	ATTATACT C CCAATGCC	487
745	UACUGUAA CUGAUGAG X CGAA ACUGUUGU	76	ACAACAGT A TTACAGTA	488
747	CAUACUGU CUGAUGAG X CGAA AUACUGUU	77	AACAGTAT T ACAGTATG	489
748	UCAUACUG CUGAUGAG X CGAA AAUACUGU	78	ACAGTATT A CAGTATGA	490
753	UGUCAUCA CUGAUGAG X CGAA ACUGUAAU	79	ATTACAGT A TGATGACA	491
763	AUUUUACA CUGAUGAG X CGAA AUGUCAUC	80	GATGACAT C TGTAAAAT	492
767	GUCUAUUU CUGAUGAG X CGAA ACAGAUGU	81	ACATCTGT A AAATAGAC	493
772	CCAAAGUC CUGAUGAG X CGAA AUUUUACA	82	TGTAAAAT A GACTTTGG	494
777	GUGUUCCA CUGAUGAG X CGAA AGUCUAUU	83	AATAGACT T TGGAACAC	495
778	UGUGUUCC CUGAUGAG X CGAA AAGUCUAU	84	ATAGACTT T GGAACACA	496
788	ACCACUUA CUGAUGAG X CGAA AUGUGUUC	85	GAACACAT A TAAGTGGT	497
790	CUACCACU CUGAUGAG X CGAA AUAUGUGU	86	ACACATAT A AGTGGTAG	498
797	AAUAAUCC CUGAUGAG X CGAA ACCACUUA	87	TAAGTGGT A GGATTATT	499
802	CAGUCAAU CUGAUGAG X CGAA AUCCUACC	88	GGTAGGAT T ATTGACTG	500
803	ACAGUCAA CUGAUGAG X CGAA AAUCCUAC	89	GTAGGATT A TTGACTGT	501

Table 9

805	GCACAGUC CUGAUGAG X CGAA AUAAUCCU	90	AGGATTAT T GACTGTGC	502
815	GACAGUAA CUGAUGAG X CGAA AGCACAGU	91	ACTGTGCT T TTACTGTC	503
816	UGACAGUA CUGAUGAG X CGAA AAGCACAG	92	CTGTGCTT T TACTGTCA	504
817	GUGACAGU CUGAUGAG X CGAA AAAGCACA	93	TGTGCTTT T ACTGTCAC	505
818	AGUGACAG CUGAUGAG X CGAA AAAAGCAC	94	GTGCTTTT A CTGTCACT	506
823	UUAAAAGU CUGAUGAG X CGAA ACAGUAAA	95	TTTACTGT C ACTTTTAA	507
827	GGGAUUAA CUGAUGAG X CGAA AGUGACAG	96	CTGTCACT T TTAATCCC	508
828	UGGGAUUA CUGAUGAG X CGAA AAGUGACA	97	TGTCACTT T TAATCCCA	509
829	UUGGGAUU CUGAUGAG X CGAA AAAGUGAC	98	GTCACTTT T AATCCCAA	510
830	UUUGGGAU CUGAUGAG X CGAA AAAAGUGA	99	TCACTTTT A ATCCCAAA	511
833	AUAUUUGG CUGAUGAG X CGAA AUUAAAAG	100	CTTTTAAT C CCAAATAT	512
840	ACGUAUCA CUGAUGAG X CGAA AUUUGGGA	101	TCCCAAAT A TGATACGT	513
845	UAAUAACG CUGAUGAG X CGAA AUCAUAUU	102	AATATGAT A CGTTATTA	514
849	CUUUUAAU CUGAUGAG X CGAA ACGUAUCA	103	TGATACGT T ATTAAAAG	515
850	GCUUUUAA CUGAUGAG X CGAA AACGUAUC	104	GATACGTT A TTAAAAGC	516
852	CAGCUUUU CUGAUGAG X CGAA AUAACGUA	105	TACGTTAT T AAAAGCTG	517
853	ACAGCUUU CUGAUGAG X CGAA AAUAACGU	106	ACGTTATT A AAAGCTGT	518
862	GCAUCUUU CUGAUGAG X CGAA ACAGCUUU	107	AAAGCTGT A AAAGATGC	519
872	AGUGUUAG CUGAUGAG X CGAA AGCAUCUU	108	AAGATGCT A CTAACACT	520
875	UCCAGUGU CUGAUGAG X CGAA AGUAGCAU	109	ATGCTACT A ACACTGGA	521
886	GCACACUU CUGAUGAG X CGAA AUUCCAGU	110	ACTGGAAT A AAGTGTGC	522
901	CGAACAUC CUGAUGAG X CGAA AUUCCAGC	111	GCTGGAAT T GATGTTCG	523
907	CACAGACG CUGAUGAG X CGAA ACAUCAAU	112	ATTGATGT T CGTCTGTG	524
908	ACACAGAC CUGAUGAG X CGAA AACAUCAA	113	TTGATGTT C GTCTGTGT	525
911	AUCACACA CUGAUGAG X CGAA ACGAACAU	114	ATGTTCGT C TGTGTGAT	526
922	GCCUCACC CUGAUGAG X CGAA ACAUCACA	115	TGTGATGT T GGTGAGGC	527
934	ACUUCUUG CUGAUGAG X CGAA AUGGCCUC	116	GAGGCCAT C CAAGAAGT	528
943	GACUCCAU CUGAUGAG X CGAA ACUUCUUG	117	CAAGAAGT T ATGGAGTC	529
944	GGACUCCA CUGAUGAG X CGAA AACUUCUU	118	AAGAAGTT A TGGAGTCC	530
951	CUUCAUAG CUGAUGAG X CGAA ACUCCAUA	119	TATGGAGT C CTATGAAG	531
954	CAACUUCA CUGAUGAG X CGAA AGGACUCC	120	GGAGTCCT A TGAAGTTG	532
961	UCUAUUUC CUGAUGAG X CGAA ACUUCAUA	121	TATGAAGT T GAAATAGA	533
967	UUCCCAUC CUGAUGAG X CGAA AUUUCAAC	122	GTTGAAAT A GATGGGAA	534
981	UCACUUGA CUGAUGAG X CGAA AUGUCUUC	123	GAAGACAT A TCAAGTGA	535
983	UUUCACUU CUGAUGAG X CGAA AUAUGUCU	124	AGACATAT C AAGTGAAA	536
997	AGAUUACG CUGAUGAG X CGAA AUUGGUUU	125	AAACCAAT C CGTAATCT	537
1001	AUUUAGAU CUGAUGAG X CGAA ACGGAUUG	126	CAATCCGT A ATCTAAAT	538
1004	UCCAUUUA CUGAUGAG X CGAA AUUACGGA	127	TCCGTAAT C TAAATGGA	539
1006	UGUCCAUU CUGAUGAG X CGAA AGAUUACG	128	CGTAATCT A AATGGACA	540
1016	CCCAAUUG CUGAUGAG X CGAA AUGUCCAU	129	ATGGACAT T CAATTGGG	541
1017	GCCCAAUU CUGAUGAG X CGAA AAUGUCCA	130	TGGACATT C AATTGGGC	542
1021	UAUUGCCC CUGAUGAG X CGAA AUUGAAUG	131	CATTCAAT T GGGCAATA	543
1029	GUAUUCUA CUGAUGAG X CGAA AUUGCCCA	132	TGGGCAAT A TAGAATAC	544
1031	AUGUAUUC CUGAUGAG X CGAA AUAUUGCC	133	GGCAATAT A GAATACAT	545
1036	CCAGCAUG CUGAUGAG X CGAA AUUCUAUA	134	TATAGAAT A CATGCTGG	546
1060	CCUUUCAC CUGAUGAG X CGAA AUCGGCAC	135	GTGCCGAT T GTGAAAGG	547
1102	AUUGCAUA CUGAUGAG X CGAA ACUUCUCC	136	GGAGAAGT A TATGCAAT	548

Table 9

1104	CAAUUGCA CUGAUGAG X CGAA AUACUUCU	137	AGAAGTAT A TGCAATTG	549
1111	AAGGUUUC CUGAUGAG X CGAA AUUGCAUA	138	TATGCAAT T GAAACCTT	550
1119	UACUACCA CUGAUGAG X CGAA AGGUUUCA	139	TGAAACCT T TGGTAGTA	551
1120	GUACUACC CUGAUGAG X CGAA AAGGUUUC	140	GAAACCTT T GGTAGTAC	552
1124	UCCUGUAC CUGAUGAG X CGAA ACCAAAGG	141	CCTTTGGT A GTACAGGA	553
1127	UUUUCCUG CUGAUGAG X CGAA ACUACCAA	142	TTGGTAGT A CAGGAAAA	554
1141	UCAUGAAC CUGAUGAG X CGAA ACACCUUU	143	AAAGGTGT T GTTCATGA	555
1144	UCAUCAUG CUGAUGAG X CGAA ACAACACC	144	GGTGTTGT T CATGATGA	556
1145	AUCAUCAU CUGAUGAG X CGAA AACAACAC	145	GTGTTGTT C ATGATGAT	557
1154	ACAUUCCA CUGAUGAG X CGAA AUCAUCAU	146	ATGATGAT A TGGAATGT	558
1163	GUAAUGUG CUGAUGAG X CGAA ACAUUCCA	147	TGGAATGT T CACATTAC	559
1164	UGUAAUGU CUGAUGAG X CGAA AACAUUCC	148	GGAATGTT C ACATTACA	560
1169	UUUCAUGU CUGAUGAG X CGAA AUGUGAAC	149	GTTCACAT T ACATGAAA	561
1170	UUUUCAUG CUGAUGAG X CGAA AAUGUGAA	150	TTCACATT A CATGAAAA	562
1181	AACAUCAA CUGAUGAG X CGAA AUUUUUCA	151	TGAAAAAT T TTGATGTT	563
1182	CAACAUCA CUGAUGAG X CGAA AAUUUUUC	152	GAAAAATT T TGATGTTG	564
1183	CCAACAUC CUGAUGAG X CGAA AAAUUUUU	153	AAAAATTT T GATGTTGG	565
1189	ACAUGUCC CUGAUGAG X CGAA ACAUCAAA	154	TTTGATGT T GGACATGT	566
1204	GGAAGCCU CUGAUGAG X CGAA AUUGGCAC	155	GTGCCAAT A AGGCTTCC	567
1210	GUUCUUGG CUGAUGAG X CGAA AGCCUUAU	156	ATAAGGCT T CCAAGAAC	568
1211	UGUUCUUG CUGAUGAG X CGAA AAGCCUUA	157	TAAGGCTT C CAAGAACA	569
1227	CAUUUAAC CUGAUGAG X CGAA AGUGUUUU	158	AAAACACT T GTTAAATG	570
1230	UGACAUUU CUGAUGAG X CGAA ACAAGUGU	159	ACACTTGT T AAATGTCA	571
1231	AUGACAUU CUGAUGAG X CGAA AACAAGUG	160	CACTTGTT A AATGTCAT	572
1237	UCAUUGAU CUGAUGAG X CGAA ACAUUUAA	161	TTAAATGT C ATCAATGA	573
1240	UUUUCAUU CUGAUGAG X CGAA AUGACAUU	162	AATGTCAT C AATGAAAA	574
1251	GGGUUCCA CUGAUGAG X CGAA AGUUUUCA	163	TGAAAACT T TGGAACCC	575
1252	AGGGUUCC CUGAUGAG X CGAA AAGUUUUC	164	GAAAACTT T GGAACCCT	576
1261	CAGAAGGC CUGAUGAG X CGAA AGGGUUCC	165	GGAACCCT T GCCTTCTG	577
1266	UGCGGCAG CUGAUGAG X CGAA AGGCAAGG	166	CCTTGCCT T CTGCCGCA	578
1267	CUGCGGCA CUGAUGAG X CGAA AAGGCAAG	167	CTTGCCTT C TGCCGCAG	579
1286	UCCCAAGC CUGAUGAG X CGAA AUCCAGCC	168	GGCTGGAT C GCTTGGGA	580
1290	UUUCUCCC CUGAUGAG X CGAA AGCGAUCC	169	GGATCGCT T GGGAGAAA	581
1301	CAAGUAUU CUGAUGAG X CGAA ACUUUCUC	170	GAGAAAGT A AATACTTG	582
1305	CCAUCAAG CUGAUGAG X CGAA AUUUACUU	171	AAGTAAAT A CTTGATGG	583
1308	GAGCCAUC CUGAUGAG X CGAA AGUAUUUA	172	TAAATACT T GATGGCTC	584
1316	AUUCUUCA CUGAUGAG X CGAA AGCCAUCA	173	TGATGGCT C TGAAGAAT	585
1325	GUCACACA CUGAUGAG X CGAA AUUCUUCA	174	TGAAGAAT C TGTGTGAC	586
1335	CAAUGCCC CUGAUGAG X CGAA AGUCACAC	175	GTGTGACT T GGGCATTG	587
1342	GGAUCUAC CUGAUGAG X CGAA AUGCCCAA	176	TTGGGCAT T GTAGATCC	588
1345	UAUGGAUC CUGAUGAG X CGAA ACAAUGCC	177	GGCATTGT A GATCCATA	589
1349	UGGAUAUG CUGAUGAG X CGAA AUCUACAA	178	TTGTAGAT C CATATCCA	590
1353	AUGGUGGA CUGAUGAG X CGAA AUGGAUCU	179	AGATCCAT A TCCACCAT	591
1355	UAAUGGUG CUGAUGAG X CGAA AUAUGGAU	180	ATCCATAT C CACCATTA	592
1362	UGUCACAU CUGAUGAG X CGAA AUGGUGGA	181	TCCACCAT T ATGTGACA	593
1363	AUGUCACA CUGAUGAG X CGAA AAUGGUGG	182	CCACCATT A TGTGACAT	594
1372	GAUCCUUU CUGAUGAG X CGAA AUGUCACA	183	TGTGACAT T AAAGGATC	595

Table 9

1373	UGAUCCUU CUGAUGAG X CGAA AAUGUCAC	184	GTGACATT A AAGGATCA	596
1380	CUGUAUAU CUGAUGAG X CGAA AUCCUUUA	185	TAAAGGAT C ATATACAG	597
1383	GCGCUGUA CUGAUGAG X CGAA AUGAUCCU	186	AGGATCAT A TACAGCGC	598
1385	UUGCGCUG CUGAUGAG X CGAA AUAUGAUC	187	GATCATAT A CAGCGCAA	599
1395	UAUGUUCA CUGAUGAG X CGAA AUUGCGCU	188	AGCGCAAT T TGAACATA	600
1396	GUAUGUUC CUGAUGAG X CGAA AAUUGCGC	189	GCGCAATT T GAACATAC	601
1403	CAGGAUGG CUGAUGAG X CGAA AUGUUCAA	190	TTGAACAT A CCATCCTG	602
1408	CGCAACAG CUGAUGAG X CGAA AUGGUAUG	191	CATACCAT C CTGTTGCG	603
1413	UUGGACGC CUGAUGAG X CGAA ACAGGAUG	192	CATCCTGT T GCGTCCAA	604
1418	ACAUGUUG CUGAUGAG X CGAA ACGCAACA	193	TGTTGCGT C CAACATGT	605
1427	AACUUCUU CUGAUGAG X CGAA ACAUGUUG	194	CAACATGT A AAGAAGTT	606
1435	CUGCUGAC CUGAUGAG X CGAA ACUUCUUU	195	AAAGAAGT T GTCAGCAG	607
1438	CCUCUGCU CUGAUGAG X CGAA ACAACUUC	196	GAAGTTGT C AGCAGAGG	608
1455	AAGUUUAA CUGAUGAG X CGAA AGUCAUCU	197	AGATGACT A TTAAACTT	609
1457	CUAAGUUU CUGAUGAG X CGAA AUAGUCAU	198	ATGACTAT T AAACTTAG	610
1458	ACUAAGUU CUGAUGAG X CGAA AAUAGUCA	199	TGACTATT A AACTTAGT	611
1463	UUUGGACU CUGAUGAG X CGAA AGUUUAAU	200	ATTAAACT T AGTCCAAA	612
1464	CUUUGGAC CUGAUGAG X CGAA AAGUUUAA	201	TTAAACTT A GTCCAAAG	613
1467	UGGCUUUG CUGAUGAG X CGAA ACUAAGUU	202	AACTTAGT C CAAAGCCA	614
1479	AAGGUGUU CUGAUGAG X CGAA AGGUGGCU	203	AGCCACCT C AACACCTT	615
1487	AGAAAAUA CUGAUGAG X CGAA AGGUGUUG	204	CAACACCT T TATTTTCT	616
1488	CAGAAAAU CUGAUGAG X CGAA AAGGUGUU	205	AACACCTT T ATTTTCTG	617
1489	UCAGAAAA CUGAUGAG X CGAA AAAGGUGU	206	ACACCTTT A TTTTCTGA	618
1491	GCUCAGAA CUGAUGAG X CGAA AUAAAGGU	207	ACCTTTAT T TTCTGAGC	619
1492	AGCUCAGA CUGAUGAG X CGAA AAUAAAGG	208	CCTTTATT T TCTGAGCT	620
1493	AAGCUCAG CUGAUGAG X CGAA AAAUAAAG	209	CTTTATTT T CTGAGCTT	621
1494	AAAGCUCA CUGAUGAG X CGAA AAAAUAAA	210	TTTATTTT C TGAGCTTT	622
1501	UUCCAACA CUGAUGAG X CGAA AGCUCAGA	211	TCTGAGCT T TGTTGGAA	623
1502	UUUCCAAC CUGAUGAG X CGAA AAGCUCAG	212	CTGAGCTT T GTTGGAAA	624
1505	UGUUUUCC CUGAUGAG X CGAA ACAAAGCU	213	AGCTTTGT T GGAAAACA	625
1518	AAUUCUGG CUGAUGAG X CGAA AUCAUGUU	214	AACATGAT A CCAGAATT	626
1526	GGCAAAUU CUGAUGAG X CGAA AUUCUGGU	215	ACCAGAAT T AATTTGCC	627
1527	UGGCAAAU CUGAUGAG X CGAA AAUUCUGG	216	CCAGAATT A ATTTGCCA	628
1530	AUGUGGCA CUGAUGAG X CGAA AUUAAUUC	217	GAATTAAT T TGCCACAT	629
1531	CAUGUGGC CUGAUGAG X CGAA AAUUAAUU	218	AATTAATT T GCCACATG	630
1541	AAACAGAC CUGAUGAG X CGAA ACAUGUGG	219	CCACATGT T GTCTGTTT	631
1544	UUAAAACA CUGAUGAG X CGAA ACAACAUG	220	CATGTTGT C TGTTTTAA	632
1548	ACUGUUAA CUGAUGAG X CGAA ACAGACAA	221	TTGTCTGT T TTAACAGT	633
1549	CACUGUUA CUGAUGAG X CGAA AACAGACA	222	TGTCTGTT T TAACAGTG	634
1550	CCACUGUU CUGAUGAG X CGAA AAACAGAC	223	GTCTGTTT T AACAGTGG	635
1551	UCCACUGU CUGAUGAG X CGAA AAAACAGA	224	TCTGTTTT A ACAGTGGA	636
1567	AAAAGUAU CUGAUGAG X CGAA ACAUGGGU	225	ACCCATGT A ATACTTTT	637
1570	GAUAAAAG CUGAUGAG X CGAA AUUACAUG	226	CATGTAAT A CTTTTATC	638
1573	AUGGAUAA CUGAUGAG X CGAA AGUAUUAC	227	GTAATACT T TTATCCAT	639
1574	CAUGGAUA CUGAUGAG X CGAA AAGUAUUA	228	TAATACTT T TATCCATG	640
1575	ACAUGGAU CUGAUGAG X CGAA AAAGUAUU	229	AATACTTT T ATCCATGT	641
1576	AACAUGGA CUGAUGAG X CGAA AAAAGUAU	230	ATACTTTT A TCCATGTT	642

Table 9

1578	UAAACAUG CUGAUGAG X CGAA AUAAAAGU	231	ACTTTTAT C CATGTTTA	643
1584	CUUUUUUA CUGAUGAG X CGAA ACAUGGAU	232	ATCCATGT T TAAAAAAG	644
1585	UCUUUUUU CUGAUGAG X CGAA AACAUGGA	233	TCCATGTT T AAAAAAGA	645
1586	UUCUUUUU CUGAUGAG X CGAA AAACAUGG	234	CCATGTTT A AAAAAGAA	646
1600	UUUGUCCA CUGAUGAG X CGAA AUUCCUUC	235	GAAGGAAT T TGGACAAA	647
1601	CUUUGUCC CUGAUGAG X CGAA AAUUCCUU	236	AAGGAATT T GGACAAAG	648
1619	UUACAUUA CUGAUGAG X CGAA ACGGUUUG	237	CAAACCGT C TAATGTAA	649
1621	AAUUACAU CUGAUGAG X CGAA AGACGGUU	238	AACCGTCT A ATGTAATT	650
1626	UGGUUAAU CUGAUGAG X CGAA ACAUUAGA	239	TCTAATGT A ATTAACCA	651
1629	CGUUGGUU CUGAUGAG X CGAA AUUACAUU	240	AATGTAAT T AACCAACG	652
1630	UCGUUGGU CUGAUGAG X CGAA AAUUACAU	241	ATGTAATT A ACCAACGA	653
1646	AGUCCGGA CUGAUGAG X CGAA AGCUUUUU	242	AAAAAGCT T TCCGGACT	654
1647	AAGUCCGG CUGAUGAG X CGAA AAGCUUUU	243	AAAAGCTT T CCGGACTT	655
1648	AAAGUCCG CUGAUGAG X CGAA AAAGCUUU	244	AAAGCTTT C CGGACTTT	656
1655	GCAUUUAA CUGAUGAG X CGAA AGUCCGGA	245	TCCGGACT T TTAAATGC	657
1656	AGCAUUUA CUGAUGAG X CGAA AAGUCCGG	246	CCGGACTT T TAAATGCT	658
1657	UAGCAUUU CUGAUGAG X CGAA AAAGUCCG	247	CGGACTTT T AAATGCTA	659
1658	UUAGCAUU CUGAUGAG X CGAA AAAAGUCC	248	GGACTTTT A AATGCTAA	660
1665	AAAACAGU CUGAUGAG X CGAA AGCAUUUA	249	TAAATGCT A ACTGTTTT	661
1671	AGGGGAAA CUGAUGAG X CGAA ACAGUUAG	250	CTAACTGT T TTTCCCCT	662
1672	AAGGGGAA CUGAUGAG X CGAA AACAGUUA	251	TAACTGTT T TTCCCCTT	663
1673	GAAGGGGA CUGAUGAG X CGAA AAACAGUU	252	AACTGTTT T TCCCCTTC	664
1674	GGAAGGGG CUGAUGAG X CGAA AAAACAGU	253	ACTGTTTT T CCCCTTCC	665
1675	AGGAAGGG CUGAUGAG X CGAA AAAAACAG	254	CTGTTTTT C CCCTTCCT	666
1680	UAGACAGG CUGAUGAG X CGAA AGGGGAAA	255	TTTCCCCT T CCTGTCTA	667
1681	CUAGACAG CUGAUGAG X CGAA AAGGGGAA	256	TTCCCCTT C CTGTCTAG	668
1686	UUUUCCUA CUGAUGAG X CGAA ACAGGAAG	257	CTTCCTGT C TAGGAAAA	669
1688	CAUUUUCC CUGAUGAG X CGAA AGACAGGA	258	TCCTGTCT A GGAAAATG	670
1699	GAGCUUUA CUGAUGAG X CGAA AGCAUUUU	259	AAAATGCT A TAAAGCTC	671
1701	UUGAGCUU CUGAUGAG X CGAA AUAGCAUU	260	AATGCTAT A AAGCTCAA	672
1707	ACUAAUUU CUGAUGAG X CGAA AGCUUUAU	261	ATAAAGCT C AAATTAGT	673
1712	UCCUAACU CUGAUGAG X CGAA AUUUGAGC	262	GCTCAAAT T AGTTAGGA	674
1713	UUCCUAAC CUGAUGAG X CGAA AAUUUGAG	263	CTCAAATT A GTTAGGAA	675
1716	UCAUUCCU CUGAUGAG X CGAA ACUAAUUU	264	AAATTAGT T AGGAATGA	676
1717	GUCAUUCC CUGAUGAG X CGAA AACUAAUU	265	AATTAGTT A GGAATGAC	677
1727	AAACGUAU CUGAUGAG X CGAA AGUCAUUC	266	GAATGACT T ATACGTTT	678
1728	AAAACGUA CUGAUGAG X CGAA AAGUCAUU	267	AATGACTT A TACGTTTT	679
1730	ACAAAACG CUGAUGAG X CGAA AUAAGUCA	268	TGACTTAT A CGTTTTGT	680
1734	CAAAACAA CUGAUGAG X CGAA ACGUAUAA	269	TTATACGT T TTGTTTTG	681
1735	UCAAAACA CUGAUGAG X CGAA AACGUAUA	270	TATACGTT T TGTTTTGA	682
1736	UUCAAAAC CUGAUGAG X CGAA AAACGUAU	271	ATACGTTT T GTTTTGAA	683
1739	GUAUUCAA CUGAUGAG X CGAA ACAAAACG	272	CGTTTTGT T TTGAATAC	684
1740	GGUAUUCA CUGAUGAG X CGAA AACAAAAC	273	GTTTTGTT T TGAATACC	685
1741	AGGUAUUC CUGAUGAG X CGAA AAACAAAA	274	TTTTGTTT T GAATACCT	686
1746	CUCUUAGG CUGAUGAG X CGAA AUUCAAAA	275	TTTTGAAT A CCTAAGAG	687
1750	GUAUCUCU CUGAUGAG X CGAA AGGUAUUC	276	GAATACCT A AGAGATAC	688
1757	CCAAAAAG CUGAUGAG X CGAA AUCUCUUA	277	TAAGAGAT A CTTTTTGG	689

Table 9

1760	UAUCCAAA CUGAUGAG X CGAA AGUAUCUC	278	GAGATACT T TTTGGATA	690
1761	AUAUCCAA CUGAUGAG X CGAA AAGUAUCU	279	AGATACTT T TTGGATAT	691
1762	AAUAUCCA CUGAUGAG X CGAA AAAGUAUC	280	GATACTTT T TGGATATT	692
1763	AAAUAUCC CUGAUGAG X CGAA AAAAGUAU	281	ATACTTTT T GGATATTT	693
1768	AAUAUAAA CUGAUGAG X CGAA AUCCAAAA	282	TTTTGGAT A TTTATATT	694
1770	GCAAUAUA CUGAUGAG X CGAA AUAUCCAA	283	TTGGATAT T TATATTGC	695
1771	GGCAAUAU CUGAUGAG X CGAA AAUAUCCA	284	TGGATATT T ATATTGCC	696
1772	UGGCAAUA CUGAUGAG X CGAA AAAUAUCC	285	GGATATTT A TATTGCCA	697
1774	UAUGGCAA CUGAUGAG X CGAA AUAAAUAU	286	ATATTTAT A TTGCCATA	698
1776	AAUAUGGC CUGAUGAG X CGAA AUAUAAAU	287	ATTTATAT T GCCATATT	699
1782	AGUAAGAA CUGAUGAG X CGAA AUGGCAAU	288	ATTGCCAT A TTCTTACT	700
1784	CAAGUAAG CUGAUGAG X CGAA AUAUGGCA	289	TGCCATAT T CTTACTTG	701
1785	UCAAGUAA CUGAUGAG X CGAA AAUAUGGC	290	GCCATATT C TTACTTGA	702
1787	AUUCAAGU CUGAUGAG X CGAA AGAAUAUG	291	CATATTCT T ACTTGAAT	703
1788	CAUUCAAG CUGAUGAG X CGAA AAGAAUAU	292	ATATTCTT A CTTGAATG	704
1791	AAGCAUUC CUGAUGAG X CGAA AGUAAGAA	293	TTCTTACT T GAATGCTT	705
1799	GUCAUUCA CUGAUGAG X CGAA AGCAUUCA	294	TGAATGCT T TGAATGAC	706
1800	AGUCAUUC CUGAUGAG X CGAA AAGCAUUC	295	GAATGCTT T GAATGACT	707
1809	ACUGGAUG CUGAUGAG X CGAA AGUCAUUC	296	GAATGACT A CATCCAGT	708
1813	CAGAACUG CUGAUGAG X CGAA AUGUAGUC	297	GACTACAT C CAGTTCTG	709
1818	AGGUGCAG CUGAUGAG X CGAA ACUGGAUG	298	CATCCAGT T CTGCACCT	710
1819	UAGGUGCA CUGAUGAG X CGAA AACUGGAU	299	ATCCAGTT C TGCACCTA	711
1827	AGAGGGUA CUGAUGAG X CGAA AGGUGCAG	300	CTGCACCT A TACCCTCT	712
1829	CCAGAGGG CUGAUGAG X CGAA AUAGGUGC	301	GCACCTAT A CCCTCTGG	713
1834	CAACACCA CUGAUGAG X CGAA AGGGUAUA	302	TATACCCT C TGGTGTTG	714
1841	UAAAAAGC CUGAUGAG X CGAA ACACCAGA	303	TCTGGTGT T GCTTTTTA	715
1845	AGGUUAAA CUGAUGAG X CGAA AGCAACAC	304	GTGTTGCT T TTTAACCT	716
1846	AAGGUUAA CUGAUGAG X CGAA AAGCAACA	305	TGTTGCTT T TTAACCTT	717
1847	GAAGGUUA CUGAUGAG X CGAA AAAGCAAC	306	GTTGCTTT T TAACCTTC	718
1848	GGAAGGUU CUGAUGAG X CGAA AAAAGCAA	307	TTGCTTTT T AACCTTCC	719
1849	AGGAAGGU CUGAUGAG X CGAA AAAAAGCA	308	TGCTTTTT A ACCTTCCT	720
1854	AUUCCAGG CUGAUGAG X CGAA AGGUUAAA	309	TTTAACCT T CCTGGAAT	721
1855	GAUUCCAG CUGAUGAG X CGAA AAGGUUAA	310	TTAACCTT C CTGGAATC	722
1863	AGAAAAUG CUGAUGAG X CGAA AUUCCAGG	311	CCTGGAAT C CATTTTCT	723
1867	UUUUAGAA CUGAUGAG X CGAA AUGGAUUC	312	GAATCCAT T TTCTAAAA	724
1868	UUUUUAGA CUGAUGAG X CGAA AAUGGAUU	313	AATCCATT T TCTAAAAA	725
1869	UUUUUUAG CUGAUGAG X CGAA AAAUGGAU	314	ATCCATTT T CTAAAAAA	726
1870	AUUUUUUA CUGAUGAG X CGAA AAAAUGGA	315	TCCATTTT C TAAAAAAT	727
1872	UUAUUUUU CUGAUGAG X CGAA AGAAAAUG	316	CATTTTCT A AAAAATAA	728
1879	UGUGUCUU CUGAUGAG X CGAA AUUUUUUA	317	TAAAAAAT A AAGACACA	729
1889	CUGAGAAG CUGAUGAG X CGAA AUGUGUCU	318	AGACACAT T CTTCTCAG	730
1890	GCUGAGAA CUGAUGAG X CGAA AAUGUGUC	319	GACACATT C TTCTCAGC	731
1892	GUGCUGAG CUGAUGAG X CGAA AGAAUGUG	320	CACATTCT T CTCAGCAC	732
1893	GGUGCUGA CUGAUGAG X CGAA AAGAAUGU	321	ACATTCTT C TCAGCACC	733
1895	GUGGUGCU CUGAUGAG X CGAA AGAAGAAU	322	ATTCTTCT C AGCACCAC	734
1913	UUUUGGAA CUGAUGAG X CGAA AGGUGUUG	323	CAACACCT A TTCCAAAA	735
1915	GAUUUUGG CUGAUGAG X CGAA AUAGGUGU	324	ACACCTAT T CCAAAATC	736

Table 9

1916	CGAUUUUG CUGAUGAG X CGAA AAUAGGUG	325	CACCTATT C CAAAATCG	737
1923	AUGUGGUC CUGAUGAG X CGAA AUUUUGGA	326	TCCAAAAT C GACCACAT	738
1932	CUUCCAAA CUGAUGAG X CGAA AUGUGGUC	327	GACCACAT A TTTGGAAG	739
1934	UACUUCCA CUGAUGAG X CGAA AUAUGUGG	328	CCACATAT T TGGAAGTA	740
1935	UUACUUCC CUGAUGAG X CGAA AAUAUGUG	329	CACATATT T GGAAGTAA	741
1942	GAGAGCUU CUGAUGAG X CGAA ACUUCCAA	330	TTGGAAGT A AAGCTCTC	742
1948	GCUGAGGA CUGAUGAG X CGAA AGCUUUAC	331	GTAAAGCT C TCCTCAGC	743
1950	UUGCUGAG CUGAUGAG X CGAA AGAGCUUU	332	AAAGCTCT C CTCAGCAA	744
1953	CAUUUGCU CUGAUGAG X CGAA AGGAGAGC	333	GCTCTCCT C AGCAAATG	745
1963	UGUUCUUU CUGAUGAG X CGAA ACAUUUGC	334	GCAAATGT A AAAGAACA	746
1977	UUUGUUAU CUGAUGAG X CGAA AUUUCUGU	335	ACAGAAAT T ATAACAAA	747
1978	GUUUGUUA CUGAUGAG X CGAA AAUUUCUG	336	CAGAAATT A TAACAAAC	748
1980	CAGUUUGU CUGAUGAG X CGAA AUAAUUUC	337	GAAATTAT A ACAAACTG	749
1990	GUCUGAGA CUGAUGAG X CGAA ACAGUUUG	338	CAAACTGT C TCTCAGAC	750
1992	UGGUCUGA CUGAUGAG X CGAA AGACAGUU	339	AACTGTCT C TCAGACCA	751
1994	UGUGGUCU CUGAUGAG X CGAA AGAGACAG	340	CTGTCTCT C AGACCACA	752
2005	UUUGGUUA CUGAUGAG X CGAA ACUGUGGU	341	ACCACAGT A TAACCAAA	753
2007	AGUUUGGU CUGAUGAG X CGAA AUACUGUG	342	CACAGTAT A ACCAAACT	754
2016	CUGAGUUC CUGAUGAG X CGAA AGUUUGGU	343	ACCAAACT A GAACTCAG	755
2022	UUAAUCCU CUGAUGAG X CGAA AGUUCUAG	344	CTAGAACT C AGGATTAA	756
2028	AGUUUCUU CUGAUGAG X CGAA AUCCUGAG	345	CTCAGGAT T AAGAAACT	757
2029	GAGUUUCU CUGAUGAG X CGAA AAUCCUGA	346	TCAGGATT A AGAAACTC	758
2037	UUUUGAGU CUGAUGAG X CGAA AGUUUCUU	347	AAGAAACT C ACTCAAAA	759
2041	GUGGUUUU CUGAUGAG X CGAA AGUGAGUU	348	AACTCACT C AAAACCAC	760
2056	UUUCCAUG CUGAUGAG X CGAA AGUUGUGU	349	ACACAACT A CATGGAAA	761
2079	UCAUUCAG CUGAUGAG X CGAA AGCAGGUU	350	AACCTGCT C CTGAATGA	762
2090	GUAUCCAG CUGAUGAG X CGAA AGUCAUUC	351	GAATGACT A CTGGATAC	763
2097	UUGUUAUG CUGAUGAG X CGAA AUCCAGUA	352	TACTGGAT A CATAACAA	764
2101	CAUUUUGU CUGAUGAG X CGAA AUGUAUCC	353	GGATACAT A ACAAAATG	765
2121	AACAUCUU CUGAUGAG X CGAA AUUUCUGC	354	GCAGAAAT A AAGATGTT	766
2129	UUUUAAAG CUGAUGAG X CGAA ACAUCUUU	355	AAAGATGT T CTTTAAAA	767
2130	GUUUUAAA CUGAUGAG X CGAA AACAUCUU	356	AAGATGTT C TTTAAAAC	768
2132	UGGUUUUA CUGAUGAG X CGAA AGAACAUC	357	GATGTTCT T TAAAACCA	769
2133	UUGGUUUU CUGAUGAG X CGAA AAGAACAU	358	ATGTTCTT T AAAACCAA	770
2134	AUUGGUUU CUGAUGAG X CGAA AAAGAACA	359	TGTTCTTT A AAACCAAT	771
2162	GAUUCUGG CUGAUGAG X CGAA AUGUUGUG	360	CACAACAT A CCAGAATC	772
2170	GUCCCAGA CUGAUGAG X CGAA AUUCUGGU	361	ACCAGAAT C TCTGGGAC	773
2172	GUGUCCCA CUGAUGAG X CGAA AGAUUCUG	362	CAGAATCT C TGGGACAC	774
2183	CUGCUUUG CUGAUGAG X CGAA AUGUGUCC	363	GGACACAT T CAAAGCAG	775
2184	ACUGCUUU CUGAUGAG X CGAA AAUGUGUC	364	GACACATT C AAAGCAGT	776
2197	UUUCCCUC CUGAUGAG X CGAA ACACACUG	365	CAGTGTGT A GAGGGAAA	777
2207	GUGCUAUA CUGAUGAG X CGAA AUUUCCCU	366	AGGGAAAT T TATAGCAC	778
2208	AGUGCUAU CUGAUGAG X CGAA AAUUUCCC	367	GGGAAATT T ATAGCACT	779
2209	UAGUGCUA CUGAUGAG X CGAA AAAUUUCC	368	GGAAATTT A TAGCACTA	780
2211	UUUAGUGC CUGAUGAG X CGAA AUAAAUUU	369	AAATTTAT A GCACTAAA	781
2217	UGGGCAUU CUGAUGAG X CGAA AGUGCUAU	370	ATAGCACT A AATGCCCA	782
2244	AUUUUAGA CUGAUGAG X CGAA AUUUCCUG	371	CAGGAAAT A TCTAAAAT	783

Table 9

2246	CAAUUUUA CUGAUGAG X CGAA AUAUUUCC	372	GGAAATAT C TAAAATTG	784
2248	GUCAAUUU CUGAUGAG X CGAA AGAUAUUU	373	AAATATCT A AAATTGAC	785
2253	AGGGUGUC CUGAUGAG X CGAA AUUUUAGA	374	TCTAAAAT T GACACCCT	786
2262	UGUGAUGU CUGAUGAG X CGAA AGGGUGUC	375	GACACCCT A ACATCACA	787
2267	UUAAUUGU CUGAUGAG X CGAA AUGUUAGG	376	CCTAACAT C ACAATTAA	788
2273	GUUCUUUU CUGAUGAG X CGAA AUUGUGAU	377	ATCACAAT T AAAAGAAC	789
2274	AGUUCUUU CUGAUGAG X CGAA AAUUGUGA	378	TCACAATT A AAAGAACT	790
2283	UGCUUCUC CUGAUGAG X CGAA AGUUCUUU	379	AAAGAACT A GAGAAGCA	791
2305	AGCUUUUC CUGAUGAG X CGAA AUGUGUUU	380	AAACACAT T GAAAAGCT	792
2314	CCUUCUCU CUGAUGAG X CGAA AGCUUUUC	381	GAAAAGCT A AGAGAAGG	793
2331	AUCUUAGU CUGAUGAG X CGAA AUUUCUUG	382	CAAGAAAT A ACTAAGAT	794
2335	UCUGAUCU CUGAUGAG X CGAA AGUUAUUU	383	AAATAACT A AGATCAGA	795
2340	UCUGCUCU CUGAUGAG X CGAA AUCUUAGU	384	ACTAAGAT C AGAGCAGA	796
2361	UGUGUCUC CUGAUGAG X CGAA AUUUCCUU	385	AAGGAAAT A GAGACACA	797
2377	UUUUUGAA CUGAUGAG X CGAA AGUUUUUU	386	AAAAAACT C TTCAAAAA	798
2379	AUUUUUUG CUGAUGAG X CGAA AGAGUUUU	387	AAAACTCT T CAAAAAAT	799
2380	GAUUUUUU CUGAUGAG X CGAA AAGAGUUU	388	AAACTCTT C AAAAAATC	800
2388	GAUUCAUU CUGAUGAG X CGAA AUUUUUUG	389	CAAAAAAT C AATGAATC	801
2396	AGCUCCUG CUGAUGAG X CGAA AUUCAUUG	390	CAATGAAT C CAGGAGCT	802
2408	UUUCAAAA CUGAUGAG X CGAA ACCAGCUC	391	GAGCTGGT T TTTGAAA	803
2409	GUUUCAAA CUGAUGAG X CGAA AACCAGCU	392	AGCTGGTT T TTTGAAAC	804
2410	CGUUUCAA CUGAUGAG X CGAA AAACCAGC	393	GCTGGTTT T TTGAAACG	805
2411	UCGUUUCA CUGAUGAG X CGAA AAAACCAG	394	CTGGTTTT T TGAAACGA	806
2412	AUCGUUUC CUGAUGAG X CGAA AAAAACCA	395	TGGTTTTT T GAAACGAT	807
2421	AUUUUGUU CUGAUGAG X CGAA AUCGUUUC	396	GAAACGAT C AACAAAAT	808
2430	UGUCUAUC CUGAUGAG X CGAA AUUUUGUU	397	AACAAAAT T GATAGACA	809
2434	CUAGUGUC CUGAUGAG X CGAA AUCAAUUU	398	AAATTGAT A GACACTAG	810
2441	AGUCUUGC CUGAUGAG X CGAA AGUGUCUA	399	TAGACACT A GCAAGACT	811
2450	UUCUUUAU CUGAUGAG X CGAA AGUCUUGC	400	GCAAGACT A ATAAAGAA	812
2453	UUCUUCUU CUGAUGAG X CGAA AUUAGUCU	401	AGACTAAT A AAGAAGAA	813
2475	UUCUAUUU CUGAUGAG X CGAA AUUCUUCU	402	AGAAGAAT C AAATAGAA	814
2480	AUUGCUUC CUGAUGAG X CGAA AUUUGAUU	403	AATCAAAT A GAAGCAAT	815
2489	UCAUUUUU CUGAUGAG X CGAA AUUGCUUC	404	GAAGCAAT A AAAAATGA	816
2499	AUCCCCUU CUGAUGAG X CGAA AUCAUUUU	405	AAAATGAT A AAGGGGAT	817
2508	GGUGGUGA CUGAUGAG X CGAA AUCCCCUU	406	AAGGGGAT A TCACCACC	818
2510	UUGGUGGU CUGAUGAG X CGAA AUAUCCCC	407	GGGGATAT C ACCACCAA	819
2520	UUCUGUGG CUGAUGAG X CGAA AUUGGUGG	408	CCACCAAT C CCACAGAA	820
2531	UGGUGGUU CUGAUGAG X CGAA AUUUCUGU	409	ACAGAAAT A AACCACCA	821
2541	UAUUCUCU CUGAUGAG X CGAA AUGGUGGU	410	ACCACCAT C AGAGAATA	822
2549	GUUUGUAG CUGAUGAG X CGAA AUUCUCUG	411	CAGAGAAT A CTACAAAC	823
2552	GGUGUUUG CUGAUGAG X CGAA AGUAUUCU	412	AGAATACT A CAAACACC	824

Input Sequence = HSU29607. Cut Site = UH/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
Seq1 = HSU29607 (Human methionine aminopeptidase mRNA, complete cds., 2569 bp)

Table 10

Table 10: Human methionine aminopeptidase type 2 (MetAP-2) NCH Ribozyme and Target Sequence

Nt. position	Ribozyme Sequence	Seq. ID Nos.	Substrate Sequence	Seq. ID Nos.
10	CCCGAGAG CUGAUGAG X CGAA IACGAGGG	825	CCCTCGTC T CTCTCGGG	1255
12	UGCCCGAG CUGAUGAG X CGAA IAGACGAG	826	CTCGTCTC T CTCGGGCA	1256
14	GUUGCCCG CUGAUGAG X CGAA IAGAGACG	827	CGTCTCTC T CGGGCAAC	1257
20	CGCCAUGU CUGAUGAG X CGAA ICCCGAGA	828	TCTCGGGC A ACATGGCG	1258
23	GCCCGCCA CUGAUGAG X CGAA IUUGCCCG	829	CGGGCAAC A TGGCGGGC	1259
49	CUCCCGGA CUGAUGAG X CGAA ICCGCUAC	830	GTAGCGGC C TCCGGGAG	1260
50	GCUCCCGG CUGAUGAG X CGAA IGCCGCUA	831	TAGCGGCC T CCGGGAGC	1261
52	UGGCUCCC CUGAUGAG X CGAA IAGGCCGC	832	GCGGCCTC C GGGAGCCA	1262
59	AUUCAGGU CUGAUGAG X CGAA ICUCCCGG	833	CCGGGAGC C ACCTGAAT	1263
60	CAUUCAGG CUGAUGAG X CGAA IGCUCCCG	834	CGGGAGCC A CCTGAATG	1264
62	GCCAUUCA CUGAUGAG X CGAA IUGGCUCC	835	GGAGCCAC C TGAATGGC	1265
63	CGCCAUUC CUGAUGAG X CGAA IGUGGCUC	836	GAGCCACC T GAATGGCG	1266
74	UGGAUCCA CUGAUGAG X CGAA IUCGCCAU	837	ATGGCGAC C TGGATCCA	1267
75	CUGGAUCC CUGAUGAG X CGAA IGUCGCCA	838	TGGCGACC T GGATCCAG	1268
81	UGUCGUCU CUGAUGAG X CGAA IAUCCAGG	839	CCTGGATC C AGACGACA	1269
82	CUGUCGUC CUGAUGAG X CGAA IGAUCCAG	840	CTGGATCC A GACGACAG	1270
89	UUCUUCCC CUGAUGAG X CGAA IUCGUCUG	841	CAGACGAC A GGGAAGAA	1271
103	GUAGAGGC CUGAUGAG X CGAA ICUCCUUC	842	GAAGGAGC T GCCTCTAC	1272
106	GCCGUAGA CUGAUGAG X CGAA ICAGCUCC	843	GGAGCTGC C TCTACGGC	1273
107	AGCCGUAG CUGAUGAG X CGAA IGCAGCUC	844	GAGCTGCC T CTACGGCT	1274
109	UCAGCCGU CUGAUGAG X CGAA IAGGCAGC	845	GCTGCCTC T ACGGCTGA	1275
115	GCUUCCUC CUGAUGAG X CGAA ICCGUAGA	846	TCTACGGC T GAGGAAGC	1276
124	UUCUUGGC CUGAUGAG X CGAA ICUUCCUC	847	GAGGAAGC A GCCAAGAA	1277
127	UUUUUCUU CUGAUGAG X CGAA ICUGCUUC	848	GAAGCAGC C AAGAAAAA	1278
128	UUUUUUCU CUGAUGAG X CGAA IGCUGCUU	849	AAGCAGCC A AGAAAAAA	1279
158	AGGCCCUU CUGAUGAG X CGAA ICUCUUCU	850	AGAAGAGC A AAGGGCCT	1280
165	CUGCAGAA CUGAUGAG X CGAA ICCCUUUG	851	CAAAGGGC C TTCTGCAG	1281
166	GCUGCAGA CUGAUGAG X CGAA IGCCCUUU	852	AAAGGGCC T TCTGCAGC	1282
169	CCUGCUGC CUGAUGAG X CGAA IAAGGCCC	853	GGGCCTTC T GCAGCAGG	1283
172	UCCCCUGC CUGAUGAG X CGAA ICAGAAGG	854	CCTTCTGC A GCAGGGGA	1284
175	UGUUCCCC CUGAUGAG X CGAA ICUGCAGA	855	TCTGCAGC A GGGGAACA	1285
183	CAGGUUCC CUGAUGAG X CGAA IUUCCCCU	856	AGGGGAAC A GGAACCTG	1286
189	CUUUAUCA CUGAUGAG X CGAA IUUCCUGU	857	ACAGGAAC C TGATAAAG	1287
190	UCUUUAUC CUGAUGAG X CGAA IGUUCCUG	858	CAGGAACC T GATAAAGA	1288
202	GAGGCUCC CUGAUGAG X CGAA IAUUCUUU	859	AAAGAATC A GGAGCCTC	1289
208	UCCACUGA CUGAUGAG X CGAA ICUCCUGA	860	TCAGGAGC C TCAGTGGA	1290
209	AUCCACUG CUGAUGAG X CGAA IGCUCCUG	861	CAGGAGCC T CAGTGGAT	1291
211	UCAUCCAC CUGAUGAG X CGAA IAGGCUCC	862	GGAGCCTC A GTGGATGA	1292
226	AACUGUCU CUGAUGAG X CGAA ICUACUUC	863	GAAGTAGC A AGACAGTT	1293
231	UUUCCAAC CUGAUGAG X CGAA IUCUUGCU	864	AGCAAGAC A GTTGGAAA	1294
244	UCCAAUGC CUGAUGAG X CGAA IAUCUUUC	865	GAAAGATC A GCATTGGA	1295
247	UCUUCCAA CUGAUGAG X CGAA ICUGAUCU	866	AGATCAGC A TTGGAAGA	1296

Table 10

307	UUUCCAGU CUGAUGAG X CGAA ICUCCAUC	867	GATGGAGC A ACTGGAAA	1297
310	UUCUUUCC CUGAUGAG X CGAA IUUGCUCC	868	GGAGCAAC T GGAAAGAA	1298
348	GAACUUUU CUGAUGAG X CGAA IUCCUCUC	869	GAGAGGAC C AAAAGTTC	1299
349	UGAACUUU CUGAUGAG X CGAA IGUCCUCU	870	AGAGGACC A AAAGTTCA	1300
357	GGUCUGUU CUGAUGAG X CGAA IAACUUUU	871	AAAAGTTC A AACAGACC	1301
361	GGAGGGUC CUGAUGAG X CGAA IUUUGAAC	872	GTTCAAAC A GACCCTCC	1302
365	UGAGGGAG CUGAUGAG X CGAA IUCUGUUU	873	AAACAGAC C CTCCCTCA	1303
366	CUGAGGGA CUGAUGAG X CGAA IGUCUGUU	874	AACAGACC C TCCCTCAG	1304
367	ACUGAGGG CUGAUGAG X CGAA IGGUCUGU	875	ACAGACCC T CCCTCAGT	1305
369	GAACUGAG CUGAUGAG X CGAA IAGGGUCU	876	AGACCCTC C CTCAGTTC	1306
370	GGAACUGA CUGAUGAG X CGAA IGAGGGUC	877	GACCCTCC C TCAGTTCC	1307
371	UGGAACUG CUGAUGAG X CGAA IGGAGGGU	878	ACCCTCCC T CAGTTCCA	1308
373	AUUGGAAC CUGAUGAG X CGAA IAGGGAGG	879	CCTCCCTC A GTTCCAAT	1309
378	CACAUAUU CUGAUGAG X CGAA IAACUGAG	880	CTCAGTTC C AATATGTG	1310
379	UCACAUAU CUGAUGAG X CGAA IGAACUGA	881	TCAGTTCC A ATATGTGA	1311
389	AGGAUACA CUGAUGAG X CGAA IUCACAUA	882	TATGTGAC C TGTATCCT	1312
390	UAGGAUAC CUGAUGAG X CGAA IGUCACAU	883	ATGTGACC T GTATCCTA	1313
396	CACCAUUA CUGAUGAG X CGAA IAUACAGG	884	CCTGTATC C TAATGGTG	1314
397	ACACCAUU CUGAUGAG X CGAA IGAUACAG	885	CTGTATCC T AATGGTGT	1315
411	GUCCUUUG CUGAUGAG X CGAA IAAAUACA	886	TGTATTTC C CAAAGGAC	1316
412	UGUCCUUU CUGAUGAG X CGAA IGAAAUAC	887	GTATTTCC C AAAGGACA	1317
413	UUGUCCUU CUGAUGAG X CGAA IGGAAAUA	888	TATTTCCC A AAGGACAA	1318
420	CGCAUUCU CUGAUGAG X CGAA IUCCUUUG	889	CAAAGGAC A AGAATGCG	1319
434	UGUGGGUG CUGAUGAG X CGAA IUAUUCGC	890	GCGAATAC C CACCCACA	1320
435	GUGUGGGU CUGAUGAG X CGAA IGUAUUCG	891	CGAATACC C ACCCACAC	1321
436	UGUGUGGG CUGAUGAG X CGAA IGGUAUUC	892	GAATACCC A CCCACACA	1322
438	CUUGUGUG CUGAUGAG X CGAA IUGGGUAU	893	ATACCCAC C CACACAAG	1323
439	UCUUGUGU CUGAUGAG X CGAA IGUGGGUA	894	TACCCACC C ACACAAGA	1324
440	AUCUUGUG CUGAUGAG X CGAA IGGUGGGU	895	ACCCACCC A CACAAGAT	1325
442	CCAUCUUG CUGAUGAG X CGAA IUGGGUGG	896	CCACCCAC A CAAGATGG	1326
444	GCCCAUCU CUGAUGAG X CGAA IUGUGGGU	897	ACCCACAC A AGATGGGC	1327
457	CAAGCAGC CUGAUGAG X CGAA IUUCGCCC	898	GGGCGAAC A GCTGCTTG	1328
460	CUCCAAGC CUGAUGAG X CGAA ICUGUUCG	899	CGAACAGC T GCTTGGAG	1329
463	GUUCUCCA CUGAUGAG X CGAA ICAGCUGU	900	ACAGCTGC T TGGAGAAC	1330
472	UCACUUGU CUGAUGAG X CGAA IUUCUCCA	901	TGGAGAAC T ACAAGTGA	1331
475	UCUUCACU CUGAUGAG X CGAA IUAGUUCU	902	AGAACTAC A AGTGAAGA	1332
493	UGAUCUAA CUGAUGAG X CGAA ICUUUCUU	903	AAGAAAGC A TTAGATCA	1333
501	CACUUGCC CUGAUGAG X CGAA IAUCUAAU	904	ATTAGATC A GGCAAGTG	1334
505	UCUUCACU CUGAUGAG X CGAA ICCUGAUC	905	GATCAGGC A AGTGAAGA	1335
538	GCUUCUGC CUGAUGAG X CGAA ICUUCUCG	906	CGAGAAGC T GCAGAAGC	1336
541	UGUGCUUC CUGAUGAG X CGAA ICAGCUUC	907	GAAGCTGC A GAAGCACA	1337
547	UGUCGAUG CUGAUGAG X CGAA ICUUCUGC	908	GCAGAAGC A CATCGACA	1338
549	CUUGUCGA CUGAUGAG X CGAA IUGCUUCU	909	AGAAGCAC A TCGACAAG	1339
555	UUCUAACU CUGAUGAG X CGAA IUCGAUGU	910	ACATCGAC A AGTTAGAA	1340
578	CUUGAUCC CUGAUGAG X CGAA ICUCAUUA	911	TAATGAGC T GGATCAAG	1341
584	CCCAGGCU CUGAUGAG X CGAA IAUCCAGC	912	GCTGGATC A AGCCTGGG	1342
588	UCAUCCCA CUGAUGAG X CGAA ICUUGAUC	913	GATCAAGC C TGGGATGA	1343

Table 10

589	GUCAUCCC CUGAUGAG X CGAA IGCUUGAU	914	ATCAAGCC T GGGATGAC	1344
598	UCUAUCAU CUGAUGAG X CGAA IUCAUCCC	915	GGGATGAC A ATGATAGA	1345
611	CUUUUCAC CUGAUGAG X CGAA IAUUUCUA	916	TAGAAATC T GTGAAAAG	1346
629	GCGUGAAC CUGAUGAG X CGAA IUCUUCCA	917	TGGAAGAC T GTTCACGC	1347
634	AACUUGCG CUGAUGAG X CGAA IAACAGUC	918	GACTGTTC A CGCAAGTT	1348
638	UAUUAACU CUGAUGAG X CGAA ICGUGAAC	919	GTTCACGC A AGTTAATA	1349
667	GCCAGGCC CUGAUGAG X CGAA ICAUUUAA	920	TTAAATGC A GGCCTGGC	1350
671	AAAUGCCA CUGAUGAG X CGAA ICCUGCAU	921	ATGCAGGC C TGGCATTT	1351
672	GAAAUGCC CUGAUGAG X CGAA IGCCUGCA	922	TGCAGGCC T GGCATTTC	1352
676	GUAGGAAA CUGAUGAG X CGAA ICCAGGCC	923	GGCCTGGC A TTTCCTAC	1353
681	AUCCAGUA CUGAUGAG X CGAA IAAAUGCC	924	GGCATTTC C TACTGGAT	1354
682	CAUCCAGU CUGAUGAG X CGAA IGAAAUGC	925	GCATTTCC T ACTGGATG	1355
685	GAACAUCC CUGAUGAG X CGAA IUAGGAAA	926	TTTCCTAC T GGATGTTC	1356
694	UUAUUGAG CUGAUGAG X CGAA IAACAUCC	927	GGATGTTC T CTCAATAA	1357
696	AAUUAUUG CUGAUGAG X CGAA IAGAACAU	928	ATGTTCTC T CAATAATT	1358
698	ACAAUUAU CUGAUGAG X CGAA IAGAGAAC	929	GTTCTCTC A ATAATTGT	1359
709	UAAUGGGC CUGAUGAG X CGAA ICACAAUU	930	AATTGTGC T GCCCATTA	1360
712	GUAUAAUG CUGAUGAG X CGAA ICAGCACA	931	TGTGCTGC C CATTATAC	1361
713	AGUAUAAU CUGAUGAG X CGAA IGCAGCAC	932	GTGCTGCC C ATTATACT	1362
714	GAGUAUAA CUGAUGAG X CGAA IGGCAGCA	933	TGCTGCCC A TTATACTC	1363
721	GCAUUGGG CUGAUGAG X CGAA IUAUAAUG	934	CATTATAC T CCCAATGC	1364
723	CGGCAUUG CUGAUGAG X CGAA IAGUAUAA	935	TTATACTC C CAATGCCG	1365
724	CCGGCAUU CUGAUGAG X CGAA IGAGUAUA	936	TATACTCC C AATGCCGG	1366
725	ACCGGCAU CUGAUGAG X CGAA IGGAGUAU	937	ATACTCCC A ATGCCGGT	1367
730	GUGUCACC CUGAUGAG X CGAA ICAUUGGG	938	CCCAATGC C GGTGACAC	1368
737	UACUGUUG CUGAUGAG X CGAA IUCACCGG	939	CCGGTGAC A CAACAGTA	1369
739	AAUACUGU CUGAUGAG X CGAA IUGUCACC	940	GGTGACAC A ACAGTATT	1370
742	UGUAAUAC CUGAUGAG X CGAA IUUGUGUC	941	GACACAAC A GTATTACA	1371
750	CAUCAUAC CUGAUGAG X CGAA IUAAUACU	942	AGTATTAC A GTATGATG	1372
761	UUUACAGA CUGAUGAG X CGAA IUCAUCAU	943	ATGATGAC A TCTGTAAA	1373
764	UAUUUUAC CUGAUGAG X CGAA IAUGUCAU	944	ATGACATC T GTAAAATA	1374
776	UGUUCCAA CUGAUGAG X CGAA IUCUAUUU	945	AAATAGAC T TTGGAACA	1375
784	CUUAUAUG CUGAUGAG X CGAA IUUCCAAA	946	TTTGGAAC A CATATAAG	1376
786	CACUUAUA CUGAUGAG X CGAA IUGUUCCA	947	TGGAACAC A TATAAGTG	1377
809	AAAAGCAC CUGAUGAG X CGAA IUCAAUAA	948	TTATTGAC T GTGCTTTT	1378
814	ACAGUAAA CUGAUGAG X CGAA ICACAGUC	949	GACTGTGC T TTTACTGT	1379
820	AAAGUGAC CUGAUGAG X CGAA IUAAAAGC	950	GCTTTTAC T GTCACTTT	1380
824	AUUAAAAG CUGAUGAG X CGAA IACAGUAA	951	TTACTGTC A CTTTTAAT	1381
826	GGAUUAAA CUGAUGAG X CGAA IUGACAGU	952	ACTGTCAC T TTTAATCC	1382
834	CAUAUUUG CUGAUGAG X CGAA IAUUAAAA	953	TTTTAATC C CAAATATG	1383
835	UCAUAUUU CUGAUGAG X CGAA IGAUUAAA	954	TTTAATCC C AAATATGA	1384
836	AUCAUAUU CUGAUGAG X CGAA IGGAUUAA	955	TTAATCCC A AATATGAT	1385
859	UCUUUUAC CUGAUGAG X CGAA ICUUUUAA	956	TTAAAAGC T GTAAAAGA	1386
871	GUGUUAGU CUGAUGAG X CGAA ICAUCUUU	957	AAAGATGC T ACTAACAC	1387
874	CCAGUGUU CUGAUGAG X CGAA IUAGCAUC	958	GATGCTAC T AACACTGG	1388
878	UAUUCCAG CUGAUGAG X CGAA IUUAGUAG	959	CTACTAAC A CTGGAATA	1389
880	UUUAUUCC CUGAUGAG X CGAA IUGUUAGU	960	ACTAACAC T GGAATAAA	1390

Table 10

895	UCAAUUCC CUGAUGAG X CGAA ICACACUU	961	AAGTGTGC T GGAATTGA	1391
912	CAUCACAC CUGAUGAG X CGAA IACGAACA	962	TGTTCGTC T GTGTGATG	1392
931	UCUUGGAU CUGAUGAG X CGAA ICCUCACC	963	GGTGAGGC C ATCCAAGA	1393
932	UUCUUGGA CUGAUGAG X CGAA IGCCUCAC	964	GTGAGGCC A TCCAAGAA	1394
935	AACUUCUU CUGAUGAG X CGAA IAUGGCCU	965	AGGCCATC C AAGAAGTT	1395
936	UAACUUCU CUGAUGAG X CGAA IGAUGGCC	966	GGCCATCC A AGAAGTTA	1396
952	ACUUCAUA CUGAUGAG X CGAA IACUCCAU	967	ATGGAGTC C TATGAAGT	1397
953	AACUUCAU CUGAUGAG X CGAA IGACUCCA	968	TGGAGTCC T ATGAAGTT	1398
979	ACUUGAUA CUGAUGAG X CGAA IUCUUCCC	969	GGGAAGAC A TATCAAGT	1399
984	GUUUCACU CUGAUGAG X CGAA IAUAUGUC	970	GACATATC A AGTGAAAC	1400
993	UACGGAUU CUGAUGAG X CGAA IUUUCACU	971	AGTGAAAC C AATCCGTA	1401
994	UUACGGAU CUGAUGAG X CGAA IGUUUCAC	972	GTGAAACC A ATCCGTAA	1402
998	UAGAUUAC CUGAUGAG X CGAA IAUUGGUU	973	AACCAATC C GTAATCTA	1403
1005	GUCCAUUU CUGAUGAG X CGAA IAUUACGG	974	CCGTAATC T AAATGGAC	1404
1014	CAAUUGAA CUGAUGAG X CGAA IUCCAUUU	975	AAATGGAC A TTCAATTG	1405
1018	UGCCCAAU CUGAUGAG X CGAA IAAUGUCC	976	GGACATTC A ATTGGGCA	1406
1026	UUCUAUAU CUGAUGAG X CGAA ICCCAAUU	977	AATTGGGC A ATATAGAA	1407
1038	UUCCAGCA CUGAUGAG X CGAA IUAUUCUA	978	TAGAATAC A TGCTGGAA	1408
1042	GUUUUUCC CUGAUGAG X CGAA ICAUGUAU	979	ATACATGC T GGAAAAAC	1409
1051	AUCGGCAC CUGAUGAG X CGAA IUUUUUCC	980	GGAAAAAC A GTGCCGAT	1410
1056	UCACAAUC CUGAUGAG X CGAA ICACUGUU	981	AACAGTGC C GATTGTGA	1411
1078	AUUCUUGU CUGAUGAG X CGAA ICCUCCCC	982	GGGGAGGC A ACAAGAAT	1412
1081	UCCAUUCU CUGAUGAG X CGAA IUUGCCUC	983	GAGGCAAC A AGAATGGA	1413
1108	GUUUCAAU CUGAUGAG X CGAA ICAUAUAC	984	GTATATGC A ATTGAAAC	1414
1117	CUACCAAA CUGAUGAG X CGAA IUUUCAAU	985	ATTGAAAC C TTTGGTAG	1415
1118	ACUACCAA CUGAUGAG X CGAA IGUUUCAA	986	TTGAAACC T TTGGTAGT	1416
1129	CCUUUUCC CUGAUGAG X CGAA IUACUACC	987	GGTAGTAC A GGAAAAGG	1417
1146	UAUCAUCA CUGAUGAG X CGAA IAACAACA	988	TGTTGTTC A TGATGATA	1418
1165	AUGUAAUG CUGAUGAG X CGAA IAACAUUC	989	GAATGTTC A CATTACAT	1419
1167	UCAUGUAA CUGAUGAG X CGAA IUGAACAU	990	ATGTTCAC A TTACATGA	1420
1172	AUUUUUCA CUGAUGAG X CGAA IUAAUGUG	991	CACATTAC A TGAAAAAT	1421
1194	UUGGCACA CUGAUGAG X CGAA IUCCAACA	992	TGTTGGAC A TGTGCCAA	1422
1200	GCCUUAUU CUGAUGAG X CGAA ICACAUGU	993	ACATGTGC C AATAAGGC	1423
1201	AGCCUUAU CUGAUGAG X CGAA IGCACAUG	994	CATGTGCC A ATAAGGCT	1424
1209	UUCUUGGA CUGAUGAG X CGAA ICCUUAUU	995	AATAAGGC T TCCAAGAA	1425
1212	UUGUUCUU CUGAUGAG X CGAA IAAGCCUU	996	AAGGCTTC C AAGAACAA	1426
1213	UUUGUUCU CUGAUGAG X CGAA IGAAGCCU	997	AGGCTTCC A AGAACAAA	1427
1219	AAGUGUUU CUGAUGAG X CGAA IUUCUUGG	998	CCAAGAAC A AAACACTT	1428
1224	UUAACAAG CUGAUGAG X CGAA IUUUUGUU	999	AACAAAAC A CTTGTTAA	1429
1226	AUUUAACA CUGAUGAG X CGAA IUGUUUUG	1000	CAAAACAC T TGTTAAAT	1430
1238	UUCAUUGA CUGAUGAG X CGAA IACAUUUA	1001	TAAATGTC A TCAATGAA	1431
1241	GUUUUCAU CUGAUGAG X CGAA IAUGACAU	1002	ATGTCATC A ATGAAAAC	1432
1250	GGUUCCAA CUGAUGAG X CGAA IUUUUCAU	1003	ATGAAAAC T TTGGAACC	1433
1258	AAGGCAAG CUGAUGAG X CGAA IUUCCAAA	1004	TTTGGAAC C CTTGCCTT	1434
1259	GAAGGCAA CUGAUGAG X CGAA IGUUCCAA	1005	TTGGAACC C TTGCCTTC	1435
1260	AGAAGGCA CUGAUGAG X CGAA IGGUUCCA	1006	TGGAACCC T TGCCTTCT	1436
1264	CGGCAGAA CUGAUGAG X CGAA ICAAGGGU	1007	ACCCTTGC C TTCTGCCG	1437

Table 10

1265	GCGGCAGA CUGAUGAG X CGAA IGCAAGGG	1008	CCCTTGCC T TCTGCCGC	1438
1268	UCUGCGGC CUGAUGAG X CGAA IAAGGCAA	1009	TTGCCTTC T GCCGCAGA	1439
1271	CCAUCUGC CUGAUGAG X CGAA ICAGAAGG	1010	CCTTCTGC C GCAGATGG	1440
1274	CAGCCAUC CUGAUGAG X CGAA ICGGCAGA	1011	TCTGCCGC A GATGGCTG	1441
1281	AGCGAUCC CUGAUGAG X CGAA ICCAUCUG	1012	CAGATGGC T GGATCGCT	1442
1289	UUCUCCCA CUGAUGAG X CGAA ICGAUCCA	1013	TGGATCGC T TGGGAGAA	1443
1307	AGCCAUCA CUGAUGAG X CGAA IUAUUUAC	1014	GTAAATAC T TGATGGCT	1444
1315	UUCUUCAG CUGAUGAG X CGAA ICCAUCAA	1015	TTGATGGC T CTGAAGAA	1445
1317	GAUUCUUC CUGAUGAG X CGAA IAGCCAUC	1016	GATGGCTC T GAAGAATC	1446
1326	AGUCACAC CUGAUGAG X CGAA IAUUCUUC	1017	GAAGAATC T GTGTGACT	1447
1334	AAUGCCCA CUGAUGAG X CGAA IUCACACA	1018	TGTGTGAC T TGGGCATT	1448
1340	AUCUACAA CUGAUGAG X CGAA ICCCAAGU	1019	ACTTGGGC A TTGTAGAT	1449
1350	GUGGAUAU CUGAUGAG X CGAA IAUCUACA	1020	TGTAGATC C ATATCCAC	1450
1351	GGUGGAUA CUGAUGAG X CGAA IGAUCUAC	1021	GTAGATCC A TATCCACC	1451
1356	AUAAUGGU CUGAUGAG X CGAA IAUAUGGA	1022	TCCATATC C ACCATTAT	1452
1357	CAUAAUGG CUGAUGAG X CGAA IGAUAUGG	1023	CCATATCC A CCATTATG	1453
1359	CACAUAAU CUGAUGAG X CGAA IUGGAUAU	1024	ATATCCAC C ATTATGTG	1454
1360	UCACAUAA CUGAUGAG X CGAA IGUGGAUA	1025	TATCCACC A TTATGTGA	1455
1370	UCCUUUAA CUGAUGAG X CGAA IUCACAUA	1026	TATGTGAC A TTAAAGGA	1456
1381	GCUGUAUA CUGAUGAG X CGAA IAUCCUUU	1027	AAAGGATC A TATACAGC	1457
1387	AAUUGCGC CUGAUGAG X CGAA IUAUAUGA	1028	TCATATAC A GCGCAATT	1458
1392	GUUCAAAU CUGAUGAG X CGAA ICGCUGUA	1029	TACAGCGC A ATTTGAAC	1459
1401	GGAUGGUA CUGAUGAG X CGAA IUUCAAAU	1030	ATTTGAAC A TACCATCC	1460
1405	AACAGGAU CUGAUGAG X CGAA IUAUGUUC	1031	GAACATAC C ATCCTGTT	1461
1406	CAACAGGA CUGAUGAG X CGAA IGUAUGUU	1032	AACATACC A TCCTGTTG	1462
1409	ACGCAACA CUGAUGAG X CGAA IAUGGUAU	1033	ATACCATC C TGTTGCGT	1463
1410	GACGCAAC CUGAUGAG X CGAA IGAUGGUA	1034	TACCATCC T GTTGCGTC	1464
1419	UACAUGUU CUGAUGAG X CGAA IACGCAAC	1035	GTTGCGTC C AACATGTA	1465
1420	UUACAUGU CUGAUGAG X CGAA IGACGCAA	1036	TTGCGTCC A ACATGTAA	1466
1423	UCUUUACA CUGAUGAG X CGAA IUUGGACG	1037	CGTCCAAC A TGTAAAGA	1467
1439	UCCUCUGC CUGAUGAG X CGAA IACAACUU	1038	AAGTTGTC A GCAGAGGA	1468
1442	AUCUCCUC CUGAUGAG X CGAA ICUGACAA	1039	TTGTCAGC A GAGGAGAT	1469
1454	AGUUUAAU CUGAUGAG X CGAA IUCAUCUC	1040	GAGATGAC T ATTAAACT	1470
1462	UUGGACUA CUGAUGAG X CGAA IUUUAAUA	1041	TATTAAAC T TAGTCCAA	1471
1468	GUGGCUUU CUGAUGAG X CGAA IACUAAGU	1042	ACTTAGTC C AAAGCCAC	1472
1469	GGUGGCUU CUGAUGAG X CGAA IGACUAAG	1043	CTTAGTCC A AAGCCACC	1473
1474	GUUGAGGU CUGAUGAG X CGAA ICUUUGGA	1044	TCCAAAGC C ACCTCAAC	1474
1475	UGUUGAGG CUGAUGAG X CGAA IGCUUUGG	1045	CCAAAGCC A CCTCAACA	1475
1477	GGUGUUGA CUGAUGAG X CGAA IUGGCUUU	1046	AAAGCCAC C TCAACACC	1476
1478	AGGUGUUG CUGAUGAG X CGAA IGUGGCUU	1047	AAGCCACC T CAACACCT	1477
1480	AAAGGUGU CUGAUGAG X CGAA IAGGUGGC	1048	GCCACCTC A ACACCTTT	1478
1483	AAUAAAGG CUGAUGAG X CGAA IUUGAGGU	1049	ACCTCAAC A CCTTTATT	1479
1485	AAAAUAAA CUGAUGAG X CGAA IUGUUGAG	1050	CTCAACAC C TTTATTTT	1480
1486	GAAAAUAA CUGAUGAG X CGAA IGUGUUGA	1051	TCAACACC T TTATTTTC	1481
1495	CAAAGCUC CUGAUGAG X CGAA IAAAAUAA	1052	TTATTTTC T GAGCTTTG	1482
1500	UCCAACAA CUGAUGAG X CGAA ICUCAGAA	1053	TTCTGAGC T TTGTTGGA	1483
1513	UGGUAUCA CUGAUGAG X CGAA IUUUUCCA	1054	TGGAAAAC A TGATACCA	1484

Table 10

1520	UUAAUUCU CUGAUGAG X CGAA IUAUCAUG	1055	CATGATAC C AGAATTAA	1485
1521	AUUAAUUC CUGAUGAG X CGAA IGUAUCAU	1056	ATGATACC A GAATTAAT	1486
1534	CAACAUGU CUGAUGAG X CGAA ICAAAUUA	1057	TAATTTGC C ACATGTTG	1487
1535	ACAACAUG CUGAUGAG X CGAA IGCAAAUU	1058	AATTTGCC A CATGTTGT	1488
1537	AGACAACA CUGAUGAG X CGAA IUGGCAAA	1059	TTTGCCAC A TGTTGTCT	1489
1545	GUUAAAAC CUGAUGAG X CGAA IACAACAU	1060	ATGTTGTC T GTTTTAAC	1490
1554	GGGUCCAC CUGAUGAG X CGAA IUUAAAAC	1061	GTTTTAAC A GTGGACCC	1491
1561	AUUACAUG CUGAUGAG X CGAA IUCCACUG	1062	CAGTGGAC C CATGTAAT	1492
1562	UAUUACAU CUGAUGAG X CGAA IGUCCACU	1063	AGTGGACC C ATGTAATA	1493
1563	GUAUUACA CUGAUGAG X CGAA IGGUCCAC	1064	GTGGACCC A TGTAATAC	1494
1572	UGGAUAAA CUGAUGAG X CGAA IUAUUACA	1065	TGTAATAC T TTTATCCA	1495
1579	UUAAACAU CUGAUGAG X CGAA IAUAAAAG	1066	CTTTTATC C ATGTTTAA	1496
1580	UUUAAACA CUGAUGAG X CGAA IGAUAAAA	1067	TTTTATCC A TGTTTAAA	1497
1606	UUUGCCUU CUGAUGAG X CGAA IUCCAAAU	1068	ATTTGGAC A AAGGCAAA	1498
1612	AGACGGUU CUGAUGAG X CGAA ICCUUUGU	1069	ACAAAGGC A AACCGTCT	1499
1616	CAUUAGAC CUGAUGAG X CGAA IUUUGCCU	1070	AGGCAAAC C GTCTAATG	1500
1620	AUUACAUU CUGAUGAG X CGAA IACGGUUU	1071	AAACCGTC T AATGTAAT	1501
1633	UUUUCGUU CUGAUGAG X CGAA IUUAAUUA	1072	TAATTAAC C AACGAAAA	1502
1634	UUUUUCGU CUGAUGAG X CGAA IGUUAAUU	1073	AATTAACC A ACGAAAAA	1503
1645	GUCCGGAA CUGAUGAG X CGAA ICUUUUUC	1074	GAAAAAGC T TTCCGGAC	1504
1649	AAAAGUCC CUGAUGAG X CGAA IAAAGCUU	1075	AAGCTTTC C GGACTTTT	1505
1654	CAUUUAAA CUGAUGAG X CGAA IUCCGGAA	1076	TTCCGGAC T TTTAAATG	1506
1664	AAACAGUU CUGAUGAG X CGAA ICAUUUAA	1077	TTAAATGC T AACTGTTT	1507
1668	GGAAAAAC CUGAUGAG X CGAA IUUAGCAU	1078	ATGCTAAC T GTTTTTCC	1508
1676	CAGGAAGG CUGAUGAG X CGAA IAAAAACA	1079	TGTTTTTC C CCTTCCTG	1509
1677	ACAGGAAG CUGAUGAG X CGAA IGAAAAAC	1080	GTTTTTCC C CTTCCTGT	1510
1678	GACAGGAA CUGAUGAG X CGAA IGGAAAAA	1081	TTTTTCCC C TTCCTGTC	1511
1679	AGACAGGA CUGAUGAG X CGAA IGGGAAAA	1082	TTTTCCCC T TCCTGTCT	1512
1682	CCUAGACA CUGAUGAG X CGAA IAAGGGGA	1083	TCCCCTTC C TGTCTAGG	1513
1683	UCCUAGAC CUGAUGAG X CGAA IGAAGGGG	1084	CCCCTTCC T GTCTAGGA	1514
1687	AUUUUCCU CUGAUGAG X CGAA IACAGGAA	1085	TTCCTGTC T AGGAAAAT	1515
1698	AGCUUUAU CUGAUGAG X CGAA ICAUUUUC	1086	GAAAATGC T ATAAAGCT	1516
1706	CUAAUUUG CUGAUGAG X CGAA ICUUUAUA	1087	TATAAAGC T CAAATTAG	1517
1708	AACUAAUU CUGAUGAG X CGAA IAGCUUUA	1088	TAAAGCTC A AATTAGTT	1518
1726	AACGUAUA CUGAUGAG X CGAA IUCAUUCC	1089	GGAATGAC T TATACGTT	1519
1748	AUCUCUUA CUGAUGAG X CGAA IUAUUCAA	1090	TTGAATAC C TAAGAGAT	1520
1749	UAUCUCUU CUGAUGAG X CGAA IGUAUUCA	1091	TGAATACC T AAGAGATA	1521
1759	AUCCAAAA CUGAUGAG X CGAA IUAUCUCU	1092	AGAGATAC T TTTTGGAT	1522
1779	AAGAAUAU CUGAUGAG X CGAA ICAAUAUA	1093	TATATTGC C ATATTCTT	1523
1780	UAAGAAUA CUGAUGAG X CGAA IGCAAUAU	1094	ATATTGCC A TATTCTTA	1524
1786	UUCAAGUA CUGAUGAG X CGAA IAAUAUGG	1095	CCATATTC T TACTTGAA	1525
1790	AGCAUUCA CUGAUGAG X CGAA IUAAGAAU	1096	ATTCTTAC T TGAATGCT	1526
1798	UCAUUCAA CUGAUGAG X CGAA ICAUUCAA	1097	TTGAATGC T TTGAATGA	1527
1808	CUGGAUGU CUGAUGAG X CGAA IUCAUUCA	1098	TGAATGAC T ACATCCAG	1528
1811	GAACUGGA CUGAUGAG X CGAA IUAGUCAU	1099	ATGACTAC A TCCAGTTC	1529
1814	GCAGAACU CUGAUGAG X CGAA IAUGUAGU	1100	ACTACATC C AGTTCTGC	1530
1815	UGCAGAAC CUGAUGAG X CGAA IGAUGUAG	1101	CTACATCC A GTTCTGCA	1531

Table 10

1820	AUAGGUGC CUGAUGAG X CGAA IAACUGGA	1102	TCCAGTTC T GCACCTAT	1532
1823	GGUAUAGG CUGAUGAG X CGAA ICAGAACU	1103	AGTTCTGC A CCTATACC	1533
1825	AGGGUAUA CUGAUGAG X CGAA IUGCAGAA	1104	TTCTGCAC C TATACCCT	1534
1826	GAGGGUAU CUGAUGAG X CGAA IGUGCAGA	1105	TCTGCACC T ATACCCTC	1535
1831	CACCAGAG CUGAUGAG X CGAA IUAUAGGU	1106	ACCTATAC C CTCTGGTG	1536
1832	ACACCAGA CUGAUGAG X CGAA IGUAUAGG	1107	CCTATACC C TCTGGTGT	1537
1833	AACACCAG CUGAUGAG X CGAA IGGUAUAG	1108	CTATACCC T CTGGTGTT	1538
1835	GCAACACC CUGAUGAG X CGAA IAGGGUAU	1109	ATACCCTC T GGTGTTGC	1539
1844	GGUUAAAA CUGAUGAG X CGAA ICAACACC	1110	GGTGTTGC T TTTTAACC	1540
1852	UCCAGGAA CUGAUGAG X CGAA IUUAAAAA	1111	TTTTTAAC C TTCCTGGA	1541
1853	UUCCAGGA CUGAUGAG X CGAA IGUUAAAA	1112	TTTTAACC T TCCTGGAA	1542
1856	GGAUUCCA CUGAUGAG X CGAA IAAGGUUA	1113	TAACCTTC C TGGAATCC	1543
1857	UGGAUUCC CUGAUGAG X CGAA IGAAGGUU	1114	AACCTTCC T GGAATCCA	1544
1864	UAGAAAAU CUGAUGAG X CGAA IAUUCCAG	1115	CTGGAATC C ATTTTCTA	1545
1865	UUAGAAAA CUGAUGAG X CGAA IGAUUCCA	1116	TGGAATCC A TTTTCTAA	1546
1871	UAUUUUUU CUGAUGAG X CGAA IAAAAUGG	1117	CCATTTTC T AAAAAATA	1547
1885	GAAGAAUG CUGAUGAG X CGAA IUCUUUAU	1118	ATAAAGAC A CATTCTTC	1548
1887	GAGAAGAA CUGAUGAG X CGAA IUGUCUUU	1119	AAAGACAC A TTCTTCTC	1549
1891	UGCUGAGA CUGAUGAG X CGAA IAAUGUGU	1120	ACACATTC T TCTCAGCA	1550
1894	UGGUGCUG CUGAUGAG X CGAA IAAGAAUG	1121	CATTCTTC T CAGCACCA	1551
1896	UGUGGUGC CUGAUGAG X CGAA IAGAAGAA	1122	TTCTTCTC A GCACCACA	1552
1899	UUGUGUGG CUGAUGAG X CGAA ICUGAGAA	1123	TTCTCAGC A CCACACAA	1553
1901	UGUUGUGU CUGAUGAG X CGAA IUGCUGAG	1124	CTCAGCAC C ACACAACA	1554
1902	GUGUUGUG CUGAUGAG X CGAA IGUGCUGA	1125	TCAGCACC A CACAACAC	1555
1904	AGGUGUUG CUGAUGAG X CGAA IUGGUGCU	1126	AGCACCAC A CAACACCT	1556
1906	AUAGGUGU CUGAUGAG X CGAA IUGUGGUG	1127	CACCACAC A ACACCTAT	1557
1909	GGAAUAGG CUGAUGAG X CGAA IUUGUGUG	1128	CACACAAC A CCTATTCC	1558
1911	UUGGAAUA CUGAUGAG X CGAA IUGUUGUG	1129	CACAACAC C TATTCCAA	1559
1912	UUUGGAAU CUGAUGAG X CGAA IGUGUUGU	1130	ACAACACC T ATTCCAAA	1560
1917	UCGAUUUU CUGAUGAG X CGAA IAAUAGGU	1131	ACCTATTC C AAAATCGA	1561
1918	GUCGAUUU CUGAUGAG X CGAA IGAAUAGG	1132	CCTATTCC A AAATCGAC	1562
1927	AAAUAUGU CUGAUGAG X CGAA IUCGAUUU	1133	AAATCGAC C ACATATTT	1563
1928	CAAAUAUG CUGAUGAG X CGAA IGUCGAUU	1134	AATCGACC A CATATTTG	1564
1930	UCCAAAUA CUGAUGAG X CGAA IUGGUCGA	1135	TCGACCAC A TATTTGGA	1565
1947	CUGAGGAG CUGAUGAG X CGAA ICUUUACU	1136	AGTAAAGC T CTCCTCAG	1566
1949	UGCUGAGG CUGAUGAG X CGAA IAGCUUUA	1137	TAAAGCTC T CCTCAGCA	1567
1951	UUUGCUGA CUGAUGAG X CGAA IAGAGCUU	1138	AAGCTCTC C TCAGCAAA	1568
1952	AUUUGCUG CUGAUGAG X CGAA IGAGAGCU	1139	AGCTCTCC T CAGCAAAT	1569
1954	ACAUUUGC CUGAUGAG X CGAA IAGGAGAG	1140	CTCTCCTC A GCAAATGT	1570
1957	UUUACAUU CUGAUGAG X CGAA ICUGAGGA	1141	TCCTCAGC A AATGTAAA	1571
1971	AUAAUUUC CUGAUGAG X CGAA IUUCUUUU	1142	AAAAGAAC A GAAATTAT	1572
1983	AGACAGUU CUGAUGAG X CGAA IUUAUAAU	1143	ATTATAAC A AACTGTCT	1573
1987	UGAGAGAC CUGAUGAG X CGAA IUUUGUUA	1144	TAACAAAC T GTCTCTCA	1574
1991	GGUCUGAG CUGAUGAG X CGAA IACAGUUU	1145	AAACTGTC T CTCAGACC	1575
1993	GUGGUCUG CUGAUGAG X CGAA IAGACAGU	1146	ACTGTCTC T CAGACCAC	1576
1995	CUGUGGUC CUGAUGAG X CGAA IAGAGACA	1147	TGTCTCTC A GACCACAG	1577
1999	UAUACUGU CUGAUGAG X CGAA IUCUGAGA	1148	TCTCAGAC C ACAGTATA	1578

Table 10

2000	UUAUACUG CUGAUGAG X CGAA IGUCUGAG	1149	CTCAGACC A CAGTATAA	1579
2002	GGUUAUAC CUGAUGAG X CGAA IUGGUCUG	1150	CAGACCAC A GTATAACC	1580
2010	UCUAGUUU CUGAUGAG X CGAA IUUAUACU	1151	AGTATAAC C AAACTAGA	1581
2011	UUCUAGUU CUGAUGAG X CGAA IGUUAUAC	1152	GTATAACC A AACTAGAA	1582
2015	UGAGUUCU CUGAUGAG X CGAA IUUUGGUU	1153	AACCAAAC T AGAACTCA	1583
2021	UAAUCCUG CUGAUGAG X CGAA IUUCUAGU	1154	ACTAGAAC T CAGGATTA	1584
2023	CUUAAUCC CUGAUGAG X CGAA IAGUUCUA	1155	TAGAACTC A GGATTAAG	1585
2036	UUUGAGUG CUGAUGAG X CGAA IUUUCUUA	1156	TAAGAAAC T CACTCAAA	1586
2038	GUUUUGAG CUGAUGAG X CGAA IAGUUUCU	1157	AGAAACTC A CTCAAAAC	1587
2040	UGGUUUUG CUGAUGAG X CGAA IUGAGUUU	1158	AAACTCAC T CAAAACCA	1588
2042	UGUGGUUU CUGAUGAG X CGAA IAGUGAGU	1159	ACTCACTC A AAACCACA	1589
2047	AGUUGUGU CUGAUGAG X CGAA IUUUUGAG	1160	CTCAAAAC C ACACAACT	1590
2048	UAGUUGUG CUGAUGAG X CGAA IGUUUUGA	1161	TCAAAACC A CACAACTA	1591
2050	UGUAGUUG CUGAUGAG X CGAA IUGGUUUU	1162	AAAACCAC A CAACTACA	1592
2052	CAUGUAGU CUGAUGAG X CGAA IUGUGGUU	1163	AACCACAC A ACTACATG	1593
2055	UUCCAUGU CUGAUGAG X CGAA IUUGUGUG	1164	CACACAAC T ACATGGAA	1594
2058	AGUUUCCA CUGAUGAG X CGAA IUAGUUGU	1165	ACAACTAC A TGGAAACT	1595
2066	GGUUGUUC CUGAUGAG X CGAA IUUUCCAU	1166	ATGGAAAC T GAACAACC	1596
2071	GAGCAGGU CUGAUGAG X CGAA IUUCAGUU	1167	AACTGAAC A ACCTGCTC	1597
2074	CAGGAGCA CUGAUGAG X CGAA IUUGUUCA	1168	TGAACAAC C TGCTCCTG	1598
2075	UCAGGAGC CUGAUGAG X CGAA IGUUGUUC	1169	GAACAACC T GCTCCTGA	1599
2078	CAUUCAGG CUGAUGAG X CGAA ICAGGUUG	1170	CAACCTGC T CCTGAATG	1600
2080	GUCAUUCA CUGAUGAG X CGAA IAGCAGGU	1171	ACCTGCTC C TGAATGAC	1601
2081	AGUCAUUC CUGAUGAG X CGAA IGAGCAGG	1172	CCTGCTCC T GAATGACT	1602
2089	UAUCCAGU CUGAUGAG X CGAA IUCAUUCA	1173	TGAATGAC T ACTGGATA	1603
2092	AUGUAUCC CUGAUGAG X CGAA IUAGUCAU	1174	ATGACTAC T GGATACAT	1604
2099	UUUUGUUA CUGAUGAG X CGAA IUAUCCAG	1175	CTGGATAC A TAACAAAA	1605
2104	CUUCAUUU CUGAUGAG X CGAA IUUAUGUA	1176	TACATAAC A AAATGAAG	1606
2115	UUUAUUUC CUGAUGAG X CGAA ICCUUCAU	1177	ATGAAGGC A GAAATAAA	1607
2131	GGUUUUAA CUGAUGAG X CGAA IAACAUCU	1178	AGATGTTC T TTAAAACC	1608
2139	UUCUCAUU CUGAUGAG X CGAA IUUUUAAA	1179	TTTAAAAC C AATGAGAA	1609
2140	GUUCUCAU CUGAUGAG X CGAA IGUUUUAA	1180	TTAAAACC A ATGAGAAC	1610
2149	UGUGUCUU CUGAUGAG X CGAA IUUCUCAU	1181	ATGAGAAC A AAGACACA	1611
2155	GUAUGUUG CUGAUGAG X CGAA IUCUUUGU	1182	ACAAAGAC A CAACATAC	1612
2157	UGGUAUGU CUGAUGAG X CGAA IUGUCUUU	1183	AAAGACAC A ACATACCA	1613
2160	UUCUGGUA CUGAUGAG X CGAA IUUGUGUC	1184	GACACAAC A TACCAGAA	1614
2164	GAGAUUCU CUGAUGAG X CGAA IUAUGUUG	1185	CAACATAC C AGAATCTC	1615
2165	AGAGAUUC CUGAUGAG X CGAA IGUAUGUU	1186	AACATACC A GAATCTCT	1616
2171	UGUCCCAG CUGAUGAG X CGAA IAUUCUGG	1187	CCAGAATC T CTGGGACA	1617
2173	UGUGUCCC CUGAUGAG X CGAA IAGAUUCU	1188	AGAATCTC T GGGACACA	1618
2179	UUUGAAUG CUGAUGAG X CGAA IUCCCAGA	1189	TCTGGGAC A CATTCAAA	1619
2181	GCUUUGAA CUGAUGAG X CGAA IUGUCCCA	1190	TGGGACAC A TTCAAAGC	1620
2185	CACUGCUU CUGAUGAG X CGAA IAAUGUGU	1191	ACACATTC A AAGCAGTG	1621
2190	CUACACAC CUGAUGAG X CGAA ICUUUGAA	1192	TTCAAAGC A GTGTGTAG	1622
2214	GCAUUUAG CUGAUGAG X CGAA ICUAUAAA	1193	TTTATAGC A CTAAATGC	1623
2216	GGGCAUUU CUGAUGAG X CGAA IUGCUAUA	1194	TATAGCAC T AAATGCCC	1624
2223	CUCUUGUG CUGAUGAG X CGAA ICAUUUAG	1195	CTAAATGC C CACAAGAG	1625

Table 10

2224	UCUCUUGU CUGAUGAG X CGAA IGCAUUUA	1196	TAAATGCC C ACAAGAGA	1626
2225	UUCUCUUG CUGAUGAG X CGAA IGGCAUUU	1197	AAATGCCC A CAAGAGAA	1627
2227	CUUUCUCU CUGAUGAG X CGAA IUGGGCAU	1198	ATGCCCAC A AGAGAAAG	1628
2237	AUAUUUCC CUGAUGAG X CGAA ICUUUCUC	1199	GAGAAAGC A GGAAATAT	1629
2247	UCAAUUUU CUGAUGAG X CGAA IAUAUUUC	1200	GAAATATC T AAAATTGA	1630
2257	UGUUAGGG CUGAUGAG X CGAA IUCAAUUU	1201	AAATTGAC A CCCTAACA	1631
2259	GAUGUUAG CUGAUGAG X CGAA IUGUCAAU	1202	ATTGACAC C CTAACATC	1632
2260	UGAUGUUA CUGAUGAG X CGAA IGUGUCAA	1203	TTGACACC C TAACATCA	1633
2261	GUGAUGUU CUGAUGAG X CGAA IGGUGUCA	1204	TGACACCC T AACATCAC	1634
2265	AAUUGUGA CUGAUGAG X CGAA IUUAGGGU	1205	ACCCTAAC A TCACAATT	1635
2268	UUUAAUUG CUGAUGAG X CGAA IAUGUUAG	1206	CTAACATC A CAATTAAA	1636
2270	CUUUUAAU CUGAUGAG X CGAA IUGAUGUU	1207	AACATCAC A ATTAAAAG	1637
2282	GCUUCUCU CUGAUGAG X CGAA IUUCUUUU	1208	AAAAGAAC T AGAGAAGC	1638
2291	UUUGCUCU CUGAUGAG X CGAA ICUUCUCU	1209	AGAGAAGC A AGAGCAAA	1639
2297	AAUGUGUU CUGAUGAG X CGAA ICUCUUGC	1210	GCAAGAGC A AACACATT	1640
2301	UUUCAAUG CUGAUGAG X CGAA IUUUGCUC	1211	GAGCAAAC A CATTGAAA	1641
2303	CUUUUCAA CUGAUGAG X CGAA IUGUUUGC	1212	GCAAACAC A TTGAAAAG	1642
2313	CUUCUCUU CUGAUGAG X CGAA ICUUUUCA	1213	TGAAAAGC T AAGAGAAG	1643
2324	UUAUUUCU CUGAUGAG X CGAA ICCUUCUC	1214	GAGAAGGC A AGAAATAA	1644
2334	CUGAUCUU CUGAUGAG X CGAA IUUAUUUC	1215	GAAATAAC T AAGATCAG	1645
2341	UUCUGCUC CUGAUGAG X CGAA IAUCUUAG	1216	CTAAGATC A GAGCAGAA	1646
2346	UUCAGUUC CUGAUGAG X CGAA ICUCUGAU	1217	ATCAGAGC A GAACTGAA	1647
2351	UUUCCUUC CUGAUGAG X CGAA IUUCUGCU	1218	AGCAGAAC T GAAGGAAA	1648
2367	GUUUUUUG CUGAUGAG X CGAA IUCUCUAU	1219	ATAGAGAC A CAAAAAAC	1649
2369	GAGUUUUU CUGAUGAG X CGAA IUGUCUCU	1220	AGAGACAC A AAAAACTC	1650
2376	UUUUGAAG CUGAUGAG X CGAA IUUUUUUG	1221	CAAAAAAC T CTTCAAAA	1651
2378	UUUUUUGA CUGAUGAG X CGAA IAGUUUUU	1222	AAAAACTC T TCAAAAAA	1652
2381	UGAUUUUU CUGAUGAG X CGAA IAAGAGUU	1223	AACTCTTC A AAAAATCA	1653
2389	GGAUUCAU CUGAUGAG X CGAA IAUUUUUU	1224	AAAAAATC A ATGAATCC	1654
2397	CAGCUCCU CUGAUGAG X CGAA IAUUCAUU	1225	AATGAATC C AGGAGCTG	1655
2398	CCAGCUCC CUGAUGAG X CGAA IGAUUCAU	1226	ATGAATCC A GGAGCTGG	1656
2404	AAAAAACC CUGAUGAG X CGAA ICUCCUGG	1227	CCAGGAGC T GGTTTTTT	1657
2422	AAUUUUGU CUGAUGAG X CGAA IAUCGUUU	1228	AAACGATC A ACAAAATT	1658
2425	AUCAAUUU CUGAUGAG X CGAA IUUGAUCG	1229	CGATCAAC A AAATTGAT	1659
2438	CUUGCUAG CUGAUGAG X CGAA IUCUAUCA	1230	TGATAGAC A CTAGCAAG	1660
2440	GUCUUGCU CUGAUGAG X CGAA IUGUCUAU	1231	ATAGACAC T AGCAAGAC	1661
2444	AUUAGUCU CUGAUGAG X CGAA ICUAGUGU	1232	ACACTAGC A AGACTAAT	1662
2449	UCUUUAUU CUGAUGAG X CGAA IUCUUGCU	1233	AGCAAGAC T AATAAAGA	1663
2476	CUUCUAUU CUGAUGAG X CGAA IAUUCUUC	1234	GAAGAATC A AATAGAAG	1664
2486	UUUUUUAU CUGAUGAG X CGAA ICUUCUAU	1235	ATAGAAGC A ATAAAAAA	1665
2511	AUUGGUGG CUGAUGAG X CGAA IAUAUCCC	1236	GGGATATC A CCACCAAT	1666
2513	GGAUUGGU CUGAUGAG X CGAA IUGAUAUC	1237	GATATCAC C ACCAATCC	1667
2514	GGGAUUGG CUGAUGAG X CGAA IGUGAUAU	1238	ATATCACC A CCAATCCC	1668
2516	GUGGGAUU CUGAUGAG X CGAA IUGGUGAU	1239	ATCACCAC C AATCCCAC	1669
2517	UGUGGGAU CUGAUGAG X CGAA IGUGGUGA	1240	TCACCACC A ATCCCACA	1670
2521	UUUCUGUG CUGAUGAG X CGAA IAUUGGUG	1241	CACCAATC C CACAGAAA	1671
2522	AUUUCUGU CUGAUGAG X CGAA IGAUUGGU	1242	ACCAATCC C ACAGAAAT	1672

Table 10

2523	UAUUUCUG CUGAUGAG X CGAA IGGAUUGG	1243	CCAATCCC A CAGAAATA	1673
2525	UUUAUUUC CUGAUGAG X CGAA IUGGGAUU	1244	AATCCCAC A GAAATAAA	1674
2535	CUGAUGGU CUGAUGAG X CGAA IUUUAUUU	1245	AAATAAAC C ACCATCAG	1675
2536	UCUGAUGG CUGAUGAG X CGAA IGUUUAUU	1246	AATAAACC A CCATCAGA	1676
2538	UCUCUGAU CUGAUGAG X CGAA IUGGUUUA	1247	TAAACCAC C ATCAGAGA	1677
2539	UUCUCUGA CUGAUGAG X CGAA IGUGGUUU	1248	AAACCACC A TCAGAGAA	1678
2542	GUAUUCUC CUGAUGAG X CGAA IAUGGUGG	1249	CCACCATC A GAGAATAC	1679
2551	GUGUUUGU CUGAUGAG X CGAA IUAUUCUC	1250	GAGAATAC T ACAAACAC	1680
2554	GAGGUGUU CUGAUGAG X CGAA IUAGUAUU	1251	AATACTAC A AACACCTC	1681
2558	CGUAGAGG CUGAUGAG X CGAA IUUUGUAG	1252	CTACAAAC A CCTCTACG	1682
2560	UGCGUAGA CUGAUGAG X CGAA IUGUUUGU	1253	ACAAACAC C TCTACGCA	1683
2561	UUGCGUAG CUGAUGAG X CGAA IGUGUUUG	1254	CAAACACC T CTACGCAA	1684

Input Sequence = HSU29607. Cut Site = CH/.			
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)			
Seq1 = HSU29607 (Human methionine aminopeptidase mRNA, complete cds., 2569 bp)			

Table 11

Table 11: Human Methionine Aminopeptidase type 2 (MetAP-2) G-cleaver Ribozyme and Target Sequence

Nt. position	Substrate Sequence	Seq. ID Nos.	Ribozyme Sequence	Seq. ID Nos.
64	GGAGCCACCU G AAUGG	1685	CCAUU UGAUGGCAUGCACUAUGCGCG AGGUGGCUCC	1834
71	CCUGAAUGGC G ACCUG	1686	CAGGU UGAUGGCAUGCACUAUGCGCG GCCAUUCAGG	1835
86	GGAUCCAGAC G ACAGG	1687	CCUGU UGAUGGCAUGCACUAUGCGCG GUCUGGAUCC	1836
104	AGAAGGAGCU G CCUCU	1688	AGAGG UGAUGGCAUGCACUAUGCGCG AGCUCCUUCU	1837
116	CUCUACGGCU G AGGAA	1689	UUCCU UGAUGGCAUGCACUAUGCGCG AGCCGUAGAG	1838
141	AAAAAAAGAC G AAAGA	1690	UCUUU UGAUGGCAUGCACUAUGCGCG GUCUUUUUUU	1839
170	AGGGCCUUCU G CAGCA	1691	UGCUG UGAUGGCAUGCACUAUGCGCG AGAAGGCCCU	1840
191	ACAGGAACCU G AUAAA	1692	UUUAU UGAUGGCAUGCACUAUGCGCG AGGUUCCUGU	1841
218	CUCAGUGGAU G AAGUA	1693	UACUU UGAUGGCAUGCACUAUGCGCG AUCCACUGAG	1842
269	AGAAAGAGAU G AAGAU	1694	AUCUU UGAUGGCAUGCACUAUGCGCG AUCUCUUUCU	1843
275	AGAUGAAGAU G AUGAA	1695	UUCAU UGAUGGCAUGCACUAUGCGCG AUCUUCAUCU	1844
278	UGAAGAUGAU G AAGAU	1696	AUCUU UGAUGGCAUGCACUAUGCGCG AUCAUCUUCA	1845
293	UGGAGAUGGC G AUGGA	1697	UCCAU UGAUGGCAUGCACUAUGCGCG GCCAUCUCCA	1846
384	GUUCCAAUAU G UGACC	1698	GGUCA UGAUGGCAUGCACUAUGCGCG AUAUUGGAAC	1847
386	UCCAAUAUGU G ACCUG	1699	CAGGU UGAUGGCAUGCACUAUGCGCG ACAUAUUGGA	1848
391	UAUGUGACCU G UAUCC	1700	GGAUA UGAUGGCAUGCACUAUGCGCG AGGUCACAUA	1849
404	UCCUAAUGGU G UAUUU	1701	AAAUA UGAUGGCAUGCACUAUGCGCG ACCAUUAGGA	1850
426	GGACAAGAAU G CGAAU	1702	AUUCG UGAUGGCAUGCACUAUGCGCG AUUCUUGUCC	1851
428	ACAAGAAUGC G AAUAC	1703	GUAUU UGAUGGCAUGCACUAUGCGCG GCAUUCUUGU	1852
453	CAAGAUGGGC G AACAG	1704	CUGUU UGAUGGCAUGCACUAUGCGCG GCCCAUCUUG	1853
461	GCGAACAGCU G CUUGG	1705	CCAAG UGAUGGCAUGCACUAUGCGCG AGCUGUUCGC	1854
479	AACUACAAGU G AAGAA	1706	UUCUU UGAUGGCAUGCACUAUGCGCG ACUUGUAGUU	1855
509	UCAGGCAAGU G AAGAG	1707	CUCUU UGAUGGCAUGCACUAUGCGCG ACUUGCCUGA	1856
524	GAUUUGGAAU G AUUUU	1708	AAAAU UGAUGGCAUGCACUAUGCGCG AUUCCAAAUC	1857
531	AAUGAUUUUC G AGAAG	1709	CUUCU UGAUGGCAUGCACUAUGCGCG GAAAAUCAUU	1858
539	UCGAGAAGCU G CAGAA	1710	UUCUG UGAUGGCAUGCACUAUGCGCG AGCUUCUCGA	1859
552	GAAGCACAUC G ACAAG	1711	CUUGU UGAUGGCAUGCACUAUGCGCG GAUGUGCUUC	1860
574	AAUACGUAAU G AGCUG	1712	CAGCU UGAUGGCAUGCACUAUGCGCG AUUACGUAUU	1861

Table 11

595	AGCCUGGGAU G ACAAU	1713	AUUGU UGAUGGCAUGCACUAUGCGCG AUCCCAGGCU	1862
601	GGAUGACAAU G AUAGA	1714	UCUAU UGAUGGCAUGCACUAUGCGCG AUUGUCAUCC	1863
612	AUAGAAAUCU G UGAAA	1715	UUUCA UGAUGGCAUGCACUAUGCGCG AGAUUUCUAU	1864
614	AGAAAUCUGU G AAAAG	1716	CUUUU UGAUGGCAUGCACUAUGCGCG ACAGAUUUCU	1865
630	UUGGAAGACU G UUCAC	1717	GUGAA UGAUGGCAUGCACUAUGCGCG AGUCUUCCAA	1866
636	GACUGUUCAC G CAAGU	1718	ACUUG UGAUGGCAUGCACUAUGCGCG GUGAACAGUC	1867
665	UGGAUUAAAU G CAGGC	1719	GCCUG UGAUGGCAUGCACUAUGCGCG AUUUAAUCCA	1868
690	CCUACUGGAU G UUCUC	1720	GAGAA UGAUGGCAUGCACUAUGCGCG AUCCAGUAGG	1869
705	CUCAAUAAUU G UGCUG	1721	CAGCA UGAUGGCAUGCACUAUGCGCG AAUUAUUGAG	1870
707	CAAUAAUUGU G CUGCC	1722	GGCAG UGAUGGCAUGCACUAUGCGCG ACAAUUAUUG	1871
710	UAAUUGUGCU G CCCAU	1723	AUGGG UGAUGGCAUGCACUAUGCGCG AGCACAAUUA	1872
728	UACUCCCAAU G CCGGU	1724	ACCGG UGAUGGCAUGCACUAUGCGCG AUUGGGAGUA	1873
734	CAAUGCCGGU G ACACA	1725	UGUGU UGAUGGCAUGCACUAUGCGCG ACCGGCAUUG	1874
755	AUUACAGUAU G AUGAC	1726	GUCAU UGAUGGCAUGCACUAUGCGCG AUACUGUAAU	1875
758	ACAGUAUGAU G ACAUC	1727	GAUGU UGAUGGCAUGCACUAUGCGCG AUCAUACUGU	1876
765	GAUGACAUCU G UAAAA	1728	UUUUA UGAUGGCAUGCACUAUGCGCG AGAUGUCAUC	1877
806	UAGGAUUAUU G ACUGU	1729	ACAGU UGAUGGCAUGCACUAUGCGCG AAUAAUCCUA	1878
810	AUUAUUGACU G UGCUU	1730	AAGCA UGAUGGCAUGCACUAUGCGCG AGUCAAUAAU	1879
812	UAUUGACUGU G CUUUU	1731	AAAAG UGAUGGCAUGCACUAUGCGCG ACAGUCAAUA	1880
821	UGCUUUUACU G UCACU	1732	AGUGA UGAUGGCAUGCACUAUGCGCG AGUAAAAGCA	1881
842	UCCCAAAUAU G AUACG	1733	CGUAU UGAUGGCAUGCACUAUGCGCG AUAUUUGGGA	1882
860	AUUAAAAGCU G UAAAA	1734	UUUUA UGAUGGCAUGCACUAUGCGCG AGCUUUUAAU	1883
869	UGUAAAAGAU G CUACU	1735	AGUAG UGAUGGCAUGCACUAUGCGCG AUCUUUUACA	1884
891	GGAAUAAAGU G UGCUG	1736	CAGCA UGAUGGCAUGCACUAUGCGCG ACUUUAUUCC	1885
893	AAUAAAGUGU G CUGGA	1737	UCCAG UGAUGGCAUGCACUAUGCGCG ACACUUUAUU	1886
902	UGCUGGAAUU G AUGUU	1738	AACAU UGAUGGCAUGCACUAUGCGCG AAUUCCAGCA	1887
905	UGGAAUUGAU G UUCGU	1739	ACGAA UGAUGGCAUGCACUAUGCGCG AUCAAUUCCA	1888
913	AUGUUCGUCU G UGUGA	1740	UCACA UGAUGGCAUGCACUAUGCGCG AGACGAACAU	1889
915	GUUCGUCUGU G UGAUG	1741	CAUCA UGAUGGCAUGCACUAUGCGCG ACAGACGAAC	1890
917	UCGUCUGUGU G AUGUU	1742	AACAU UGAUGGCAUGCACUAUGCGCG ACACAGACGA	1891
920	UCUGUGUGAU G UUGGU	1743	ACCAA UGAUGGCAUGCACUAUGCGCG AUCACACAGA	1892

Table 11

926	UGAUGUUGGU G AGGCC	1744	GGCCU UGAUGGCAUGCACUAUGCGCG ACCAACAUCA	1893
956	GGAGUCCUAU G AAGUU	1745	AACUU UGAUGGCAUGCACUAUGCGCG AUAGGACUCC	1894
962	CUAUGAAGUU G AAAUA	1746	UAUUU UGAUGGCAUGCACUAUGCGCG AACUUCAUAG	1895
988	CAUAUCAAGU G AAACC	1747	GGUUU UGAUGGCAUGCACUAUGCGCG ACUUGAUAUG	1896
1040	UAGAAUACAU G CUGGA	1748	UCCAG UGAUGGCAUGCACUAUGCGCG AUGUAUUCUA	1897
1054	GAAAAACAGU G CCGAU	1749	AUCGG UGAUGGCAUGCACUAUGCGCG ACUGUUUUUC	1898
1057	AAACAGUGCC G AUUGU	1750	ACAAU UGAUGGCAUGCACUAUGCGCG GGCACUGUUU	1899
1061	AGUGCCGAUU G UGAAA	1751	UUUCA UGAUGGCAUGCACUAUGCGCG AAUCGGCACU	1900
1063	UGCCGAUUGU G AAAGG	1752	CCUUU UGAUGGCAUGCACUAUGCGCG ACAAUCGGCA	1901
1106	AGAAGUAUAU G CAAUU	1753	AAUUG UGAUGGCAUGCACUAUGCGCG AUAUACUUCU	1902
1112	AUAUGCAAUU G AAACC	1754	GGUUU UGAUGGCAUGCACUAUGCGCG AAUUGCAUAU	1903
1139	AGGAAAAGGU G UUGUU	1755	AACAA UGAUGGCAUGCACUAUGCGCG ACCUUUUCCU	1904
1142	AAAAGGUGUU G UUCAU	1756	AUGAA UGAUGGCAUGCACUAUGCGCG AACACCUUUU	1905
1148	UGUUGUUCAU G AUGAU	1757	AUCAU UGAUGGCAUGCACUAUGCGCG AUGAACAACA	1906
1151	UGUUCAUGAU G AUAUG	1758	CAUAU UGAUGGCAUGCACUAUGCGCG AUCAUGAACA	1907
1161	GAUAUGGAAU G UUCAC	1759	GUGAA UGAUGGCAUGCACUAUGCGCG AUUCCAUAUC	1908
1174	CACAUUACAU G AAAAA	1760	UUUUU UGAUGGCAUGCACUAUGCGCG AUGUAAUGUG	1909
1184	GAAAAAUUUU G AUGUU	1761	AACAU UGAUGGCAUGCACUAUGCGCG AAAAUUUUUC	1910
1187	AAAUUUUGAU G UUGGA	1762	UCCAA UGAUGGCAUGCACUAUGCGCG AUCAAAAUUU	1911
1196	UGUUGGACAU G UGCCA	1763	UGGCA UGAUGGCAUGCACUAUGCGCG AUGUCCAACA	1912
1198	UUGGACAUGU G CCAAU	1764	AUUGG UGAUGGCAUGCACUAUGCGCG ACAUGUCCAA	1913
1228	CAAAACACUU G UUAAA	1765	UUUAA UGAUGGCAUGCACUAUGCGCG AAGUGUUUUG	1914
1235	CUUGUUAAAU G UCAUC	1766	GAUGA UGAUGGCAUGCACUAUGCGCG AUUUAACAAG	1915
1244	UGUCAUCAAU G AAAAC	1767	GUUUU UGAUGGCAUGCACUAUGCGCG AUUGAUGACA	1916
1262	UGGAACCCUU G CCUUC	1768	GAAGG UGAUGGCAUGCACUAUGCGCG AAGGGUUCCA	1917
1269	CUUGCCUUCU G CCGCA	1769	UGCGG UGAUGGCAUGCACUAUGCGCG AGAAGGCAAG	1918
1272	GCCUUCUGCC G CAGAU	1770	AUCUG UGAUGGCAUGCACUAUGCGCG GGCAGAAGGC	1919
1287	UGGCUGGAUC G CUUGG	1771	CCAAG UGAUGGCAUGCACUAUGCGCG GAUCCAGCCA	1920
1309	GUAAAUACUU G AUGGC	1772	GCCAU UGAUGGCAUGCACUAUGCGCG AAGUAUUUAC	1921
1318	UGAUGGCUCU G AAGAA	1773	UUCUU UGAUGGCAUGCACUAUGCGCG AGAGCCAUCA	1922
1327	UGAAGAAUCU G UGUGA	1774	UCACA UGAUGGCAUGCACUAUGCGCG AGAUUCUUCA	1923

Table 11

1329	AAGAAUCUGU G UGACU	1775	AGUCA UGAUGGCAUGCACUAUGCGCG ACAGAUUCUU	1924
1331	GAAUCUGUGU G ACUUG	1776	CAAGU UGAUGGCAUGCACUAUGCGCG ACACAGAUUC	1925
1343	CUUGGGCAUU G UAGAU	1777	AUCUA UGAUGGCAUGCACUAUGCGCG AAUGCCCAAG	1926
1365	CCACCAUUAU G UGACA	1778	UGUCA UGAUGGCAUGCACUAUGCGCG AUAAUGGUGG	1927
1367	ACCAUUAUGU G ACAUU	1779	AAUGU UGAUGGCAUGCACUAUGCGCG ACAUAAUGGU	1928
1390	CAUAUACAGC G CAAUU	1780	AAUUG UGAUGGCAUGCACUAUGCGCG GCUGUAUAUG	1929
1397	AGCGCAAUUU G AACAU	1781	AUGUU UGAUGGCAUGCACUAUGCGCG AAAUUGCGCU	1930
1411	AUACCAUCCU G UUGCG	1782	CGCAA UGAUGGCAUGCACUAUGCGCG AGGAUGGUAU	1931
1414	CCAUCCUGUU G CGUCC	1783	GGACG UGAUGGCAUGCACUAUGCGCG AACAGGAUGG	1932
1425	CGUCCAACAU G UAAAG	1784	CUUUA UGAUGGCAUGCACUAUGCGCG AUGUUGGACG	1933
1436	UAAAGAAGUU G UCAGC	1785	GCUGA UGAUGGCAUGCACUAUGCGCG AACUUCUUUA	1934
1451	CAGAGGAGAU G ACUAU	1786	AUAGU UGAUGGCAUGCACUAUGCGCG AUCUCCUCUG	1935
1496	UUUAUUUUCU G AGCUU	1787	AAGCU UGAUGGCAUGCACUAUGCGCG AGAAAAUAAA	1936
1503	UCUGAGCUUU G UUGGA	1788	UCCAA UGAUGGCAUGCACUAUGCGCG AAAGCUCAGA	1937
1515	UGGAAAACAU G AUACC	1789	GGUAU UGAUGGCAUGCACUAUGCGCG AUGUUUUCCA	1938
1532	GAAUUAAUUU G CCACA	1790	UGUGG UGAUGGCAUGCACUAUGCGCG AAAUUAAUUC	1939
1539	UUUGCCACAU G UUGUC	1791	GACAA UGAUGGCAUGCACUAUGCGCG AUGUGGCAAA	1940
1542	GCCACAUGUU G UCUGU	1792	ACAGA UGAUGGCAUGCACUAUGCGCG AACAUGUGGC	1941
1546	CAUGUUGUCU G UUUUA	1793	UAAAA UGAUGGCAUGCACUAUGCGCG AGACAACAUG	1942
1565	GUGGACCCAU G UAAUA	1794	UAUUA UGAUGGCAUGCACUAUGCGCG AUGGGUCCAC	1943
1582	UUUUAUCCAU G UUUAA	1795	UUAAA UGAUGGCAUGCACUAUGCGCG AUGGAUAAAA	1944
1624	ACCGUCUAAU G UAAUU	1796	AAUUA UGAUGGCAUGCACUAUGCGCG AUUAGACGGU	1945
1637	AUUAACCAAC G AAAAA	1797	UUUUU UGAUGGCAUGCACUAUGCGCG GUUGGUUAAU	1946
1662	ACUUUUAAAU G CUAAC	1798	GUUAG UGAUGGCAUGCACUAUGCGCG AUUUAAAAGU	1947
1669	AAUGCUAACU G UUUUU	1799	AAAAA UGAUGGCAUGCACUAUGCGCG AGUUAGCAUU	1948
1684	UCCCCUUCCU G UCUAG	1800	CUAGA UGAUGGCAUGCACUAUGCGCG AGGAAGGGGA	1949
1696	CUAGGAAAAU G CUAUA	1801	UAUAG UGAUGGCAUGCACUAUGCGCG AUUUUCCUAG	1950
1723	AGUUAGGAAU G ACUUA	1802	UAAGU UGAUGGCAUGCACUAUGCGCG AUUCCUAACU	1951
1737	UAUACGUUUU G UUUUG	1803	CAAAA UGAUGGCAUGCACUAUGCGCG AAAACGUAUA	1952
1742	GUUUUGUUUU G AAUAC	1804	GUAUU UGAUGGCAUGCACUAUGCGCG AAAACAAAAC	1953
1777	UAUUUAUAUU G CCAUA	1805	UAUGG UGAUGGCAUGCACUAUGCGCG AAUAUAAAUA	1954

Table 11

1792	AUUCUUACUU G AAUGC	1806	GCAUU UGAUGGCAUGCACUAUGCGCG AAGUAAGAAU	1955
1796	UUACUUGAAU G CUUUG	1807	CAAAG UGAUGGCAUGCACUAUGCGCG AUUCAAGUAA	1956
1801	UGAAUGCUUU G AAUGA	1808	UCAUU UGAUGGCAUGCACUAUGCGCG AAAGCAUUCA	1957
1805	UGCUUUGAAU G ACUAC	1809	GUAGU UGAUGGCAUGCACUAUGCGCG AUUCAAAGCA	1958
1821	AUCCAGUUCU G CACCU	1810	AGGUG UGAUGGCAUGCACUAUGCGCG AGAACUGGAU	1959
1839	ACCCUCUGGU G UUGCU	1811	AGCAA UGAUGGCAUGCACUAUGCGCG ACCAGAGGGU	1960
1842	CUCUGGUGUU G CUUUU	1812	AAAAG UGAUGGCAUGCACUAUGCGCG AACACCAGAG	1961
1924	UUCCAAAAUC G ACCAC	1813	GUGGU UGAUGGCAUGCACUAUGCGCG GAUUUUGGAA	1962
1961	CUCAGCAAAU G UAAAA	1814	UUUUA UGAUGGCAUGCACUAUGCGCG AUUUGCUGAG	1963
1988	AUAACAAACU G UCUCU	1815	AGAGA UGAUGGCAUGCACUAUGCGCG AGUUUGUUAU	1964
2067	CAUGGAAACU G AACAA	1816	UUGUU UGAUGGCAUGCACUAUGCGCG AGUUUCCAUG	1965
2076	UGAACAACCU G CUCCU	1817	AGGAG UGAUGGCAUGCACUAUGCGCG AGGUUGUUCA	1966
2082	ACCUGCUCCU G AAUGA	1818	UCAUU UGAUGGCAUGCACUAUGCGCG AGGAGCAGGU	1967
2086	GCUCCUGAAU G ACUAC	1819	GUAGU UGAUGGCAUGCACUAUGCGCG AUUCAGGAGC	1968
2109	AUAACAAAAU G AAGGC	1820	GCCUU UGAUGGCAUGCACUAUGCGCG AUUUUGUUAU	1969
2127	AAAUAAAGAU G UUCUU	1821	AAGAA UGAUGGCAUGCACUAUGCGCG AUCUUUAUUU	1970
2143	UAAAACCAAU G AGAAC	1822	GUUCU UGAUGGCAUGCACUAUGCGCG AUUGGUUUUA	1971
2193	UCAAAGCAGU G UGUAG	1823	CUACA UGAUGGCAUGCACUAUGCGCG ACUGCUUUGA	1972
2195	AAAGCAGUGU G UAGAG	1824	CUCUA UGAUGGCAUGCACUAUGCGCG ACACUGCUUU	1973
2221	AGCACUAAAU G CCCAC	1825	GUGGG UGAUGGCAUGCACUAUGCGCG AUUUAGUGCU	1974
2254	AUCUAAAAUU G ACACC	1826	GGUGU UGAUGGCAUGCACUAUGCGCG AAUUUUAGAU	1975
2306	CAAACACAUU G AAAAG	1827	CUUUU UGAUGGCAUGCACUAUGCGCG AAUGUGUUUG	1976
2352	GAGCAGAACU G AAGGA	1828	UCCUU UGAUGGCAUGCACUAUGCGCG AGUUCUGCUC	1977
2392	AAAAAUCAAU G AAUCC	1829	GGAUU UGAUGGCAUGCACUAUGCGCG AUUGAUUUUU	1978
2413	CUGGUUUUUU G AAACG	1830	CGUUU UGAUGGCAUGCACUAUGCGCG AAAAAACCAG	1979
2418	UUUUUGAAAC G AUCAA	1831	UUGAU UGAUGGCAUGCACUAUGCGCG GUUUCAAAAA	1980
2431	CAACAAAAUU G AUAGA	1832	UCUAU UGAUGGCAUGCACUAUGCGCG AAUUUUGUUG	1981
2496	AAUAAAAAAU G AUAAA	1833	UUUAU UGAUGGCAUGCACUAUGCGCG AUUUUUUAUU	1982

Input Sequence = HSU29607. Cut Site = YG/M or UG/U.
Stem Length = 5/10. Core Sequence = UGAUG GCAUGCACUAUGC GCG

Table 11

Seq1 = HSU29607 (Human methionine aminopeptidase mRNA, complete cds., 2569 bp)		

Table 12

Table 12: Anti Human MetAP-2 HH, NCH, and G-Cleaver Ribozymes

Alias	Ribozyme Sequence	Seq. ID Nos.	Substrate Seq.	Seq. ID Nos.
HH				
MAP2-11	CCCGAGA CUGAUGAGGCCGUUAGGCCGAA AGACGAG	1983	CUCGUCU C UCUCGGG	2001
MAP2-15	GUUGCCC CUGAUGAGGCCGUUAGGCCGAA AGAGAGA	1984	UCUCUCU C GGGCAAC	2002
MAP2-464	GUUCUCC CUGAUGAGGCCGUUAGGCCGAA AGCAGCU	1985	AGCUGCU U GGAGAAC	2003
MAP2-911	UCACACA CUGAUGAGGCCGUUAGGCCGAA ACGAACA	1986	UGUUCGU C UGUGUGA	2004
MAP2-1290	UUCUCCC CUGAUGAGGCCGUUAGGCCGAA AGCGAUC	1987	GAUCGCU U GGGAGAA	2005
MAP2-1342	GAUCUAC CUGAUGAGGCCGUUAGGCCGAA AUGCCCA	1988	UGGGCAU U GUAGAUC	2006
MAP2-1479	AGGUGUU CUGAUGAGGCCGUUAGGCCGAA AGGUGGC	1989	GCCACCU C AACACCU	2007
MAP2-1646	GUCCGGA CUGAUGAGGCCGUUAGGCCGAA AGCUUUU	1990	AAAAGCU U UCCGGAC	2008
MAP2-1819	AGGUGCA CUGAUGAGGCCGUUAGGCCGAA AACUGGA	1991	UCCAGUU C UGCACCU	2009
MAP2-2262	GUGAUGU CUGAUGAGGCCGUUAGGCCGAA AGGGUGU	1992	ACACCCU A ACAUCAC	2010
MAP2-10	CCGAGAG CUGAUGAGGCCGUUAGGCCGAA GACGAGG	1993	CCUCGUC U CUCUCGG	2011
NCH				
MAP2-369	AACUGAG CUGAUGAGGCCGUUAGGCCGAA IAGGGUC	1994	GACCCUC C CUCAGUU	2012
MAP2-370	GAACUGA CUGAUGAGGCCGUUAGGCCGAA IGAGGGU	1995	ACCCUCC C UCAGUUC	2013
MAP2-1901	GUUGUGU CUGAUGAGGCCGUUAGGCCGAA IUGCUGA	1996	UCAGCAC C ACACAAC	2014
MAP2-1906	UAGGUGU CUGAUGAGGCCGUUAGGCCGAA IUGUGGU	1997	ACCACAC A ACACCUA	2015
G-Cleaver				
MAP2-1821	AGGUG UGAUGGCAUGCACUAUGCGCG AGAACUGGAU	1998	AUCCAGUUCU G CACCU	2016
MAP2-2076	AGGAG UGAUGGCAUGCACUAUGCGCG AGGUUGUUCA	1999	UGAACAACCU G CUCCU	2017
MAP2-2086	GUAGU UGAUGGCAUGCACUAUGCGCG AUUCAGGAGC	2000	GCUCCUGAAU G ACUAC	2018

Table 13

Table 13: Human telomerase reverse transcriptase (TERT) Hammerhead Ribozyme and Target Sequence

nt. Position	Ribozyme Sequence	Seq ID Nos.	Substrate Sequence	Seq ID Nos.
13	CGCAGCAG CUGAUGAG X CGAA ACGCAGCG		CGCTGCGT C CTGCTGCG	
68	GCAGCGGG CUGAUGAG X CGAA AGCGCGCG		CGCGCGCT C CCCGCTGC	
90	GCAGCAGG CUGAUGAG X CGAA AGCGCACG		CGTGCGCT C CCTGCTGC	
108	CCUCGCGG CUGAUGAG X CGAA AGUGGCUG		CAGCCACT A CCGCGAGG	
135	GCCGCACG CUGAUGAG X CGAA ACGUGGCC		GGCCACGT T CGTGCGGC	
136	CGCCGCAC CUGAUGAG X CGAA AACGUGGC		GCCACGTT C GTGCGGCG	
194	CGCGCGGA CUGAUGAG X CGAA AGCCGCCG		CGGCGGCT T TCCGCGCG	
195	GCGCGCGG CUGAUGAG X CGAA AAGCCGCC		GGCGGCTT T CCGCGCGC	
196	AGCGCGCG CUGAUGAG X CGAA AAAGCCGC		GCGGCTTT C CGCGCGCT	
264	GGCGGAAG CUGAUGAG X CGAA AGGGGGCG		CGCCCCCT C CTTCCGCC	
267	CCUGGCGG CUGAUGAG X CGAA AGGAGGGG		CCCCTCCT T CCGCCAGG	
268	ACCUGGCG CUGAUGAG X CGAA AAGGAGGG		CCCTCCTT C CGCCAGGT	
279	UCAGGCAG CUGAUGAG X CGAA ACACCUGG		CCAGGTGT C CTGCCTGA	
351	CGAAGCCG CUGAUGAG X CGAA AGGCCAGC		GCTGGCCT T CGGCTTCG	
352	GCGAAGCC CUGAUGAG X CGAA AAGGCCAG		CTGGCCTT C GGCTTCGC	
357	GCAGCGCG CUGAUGAG X CGAA AGCCGAAG		CTTCGGCT T CGCGCTGC	
358	AGCAGCGC CUGAUGAG X CGAA AAGCCGAA		TTCGGCTT C GCGCTGCT	
399	UGGUGGUG CUGAUGAG X CGAA AGGCCUCG		CGAGGCCT T CACCACCA	
400	CUGGUGGU CUGAUGAG X CGAA AAGGCCUC		GAGGCCTT C ACCACCAG	
420	UGGGCAGG CUGAUGAG X CGAA AGCUGCGC		GCGCAGCT A CCTGCCCA	
505	AGCAGGUG CUGAUGAG X CGAA ACCAGCAC		GTGCTGGT T CACCTGCT	
506	CAGCAGGU CUGAUGAG X CGAA AACCAGCA		TGCTGGTT C ACCTGCTG	
529	AGCACAAA CUGAUGAG X CGAA AGCGCGCA		TGCGCGCT C TTTGTGCT	
531	CCAGCACA CUGAUGAG X CGAA AGAGCGCG		CGCGCTCT T TGTGCTGG	
532	ACCAGCAC CUGAUGAG X CGAA AAGAGCGC		GCGCTCTT T GTGCTGGT	
545	GCAGCUGG CUGAUGAG X CGAA AGCCACCA		TGGTGGCT C CCAGCTGC	
558	ACACCUGG CUGAUGAG X CGAA AGGCGCAG		CTGCGCCT A CCAGGTGT	
582	CGAGCUGG CUGAUGAG X CGAA ACAGCGGC		GCCGCTGT A CCAGCTCG	
589	GCAGCGCC CUGAUGAG X CGAA AGCUGGUA		TACCAGCT C GGCGCTGC	
602	CCGGGCCU CUGAUGAG X CGAA AGUGGCAG		CTGCCACT C AGGCCCGG	
626	GGGUCCAC CUGAUGAG X CGAA AGCGUGUG		CACACGCT A GTGGACCC	
644	GCAUCCCA CUGAUGAG X CGAA ACGCCUUC		GAAGGCGT C TGGGATGC	
671	CCUGACGC CUGAUGAG X CGAA AUGGUUCC		GGAACCAT A GCGTCAGG	
676	GCCUCCCU CUGAUGAG X CGAA ACGCUAUG		CATAGCGT C AGGGAGGC	
691	CCCAGGGG CUGAUGAG X CGAA ACCCCGGC		GCCGGGGT C CCCCTGGG	
749	CAACGGCA CUGAUGAG X CGAA ACUUCGGC		GCCGAAGT C TGCCGTTG	
756	UCUUGGGC CUGAUGAG X CGAA ACGGCAGA		TCTGCCGT T GCCCAAGA	
808	CCCUGCCC CUGAUGAG X CGAA ACGGGCGU		ACGCCCGT T GGGCAGGG	
819	GGGCCCAG CUGAUGAG X CGAA ACCCCUGC		GCAGGGGT C CTGGGCCC	
863	CACACAGA CUGAUGAG X CGAA ACCACGGU		ACCGTGGT T TCTGTGTG	
864	CCACACAG CUGAUGAG X CGAA AACCACGG		CCGTGGTT T CTGTGTGG	
865	ACCACACA CUGAUGAG X CGAA AAACCACG		CGTGGTTT C TGTGTGGT	
876	UGGCAGGU CUGAUGAG X CGAA ACACCACA		TGTGGTGT C ACCTGCCA	

Table 13

906	CCUCCAAA CUGAUGAG X CGAA AGGUGGCU		AGCCACCT C TTTGGAGG	
908	ACCCUCCA CUGAUGAG X CGAA AGAGGUGG		CCACCTCT T TGGAGGGT	
909	CACCCUCC CUGAUGAG X CGAA AAGAGGUG		CACCTCTT T GGAGGGTG	
922	GUGCCAGA CUGAUGAG X CGAA AGCGCACC		GGTGCGCT C TCTGGCAC	
924	GCGUGCCA CUGAUGAG X CGAA AGAGCGCA		TGCGCTCT C TGGCACGC	
939	AUGGGUGG CUGAUGAG X CGAA AGUGGCGC		GCGCCACT C CCACCCAT	
948	GGCCCACG CUGAUGAG X CGAA AUGGGUGG		CCACCCAT C CGTGGGCC	
981	GCGAUGUG CUGAUGAG X CGAA AUGGGGGG		CCCCCCAT C CACATCGC	
987	GUGGCCGC CUGAUGAG X CGAA AUGUGGAU		ATCCACAT C GCGGCCAC	
1001	GUCCCAGG CUGAUGAG X CGAA ACGUGGUG		CACCACGT C CCTGGGAC	
1016	CGGGGGAC CUGAUGAG X CGAA AGGCGUGU		ACACGCCT T GTCCCCCG	
1019	CACCGGGG CUGAUGAG X CGAA ACAAGGCG		CGCCTTGT C CCCCGGTG	
1029	UCUCGGCG CUGAUGAG X CGAA ACACCGGG		CCCGGTGT A CGCCGAGA	
1047	AGUAGAGG CUGAUGAG X CGAA AGUGCUUG		CAAGCACT T CCTCTACT	
1048	GAGUAGAG CUGAUGAG X CGAA AAGUGCUU		AAGCACTT C CTCTACTC	
1051	GAGGAGUA CUGAUGAG X CGAA AGGAAGUG		CACTTCCT C TACTCCTC	
1053	CUGAGGAG CUGAUGAG X CGAA AGAGGAAG		CTTCCTCT A CTCCTCAG	
1056	CGCCUGAG CUGAUGAG X CGAA AGUAGAGG		CCTCTACT C CTCAGGCG	
1059	UGUCGCCU CUGAUGAG X CGAA AGGAGUAG		CTACTCCT C AGGCGACA	
1086	GUAGGAAG CUGAUGAG X CGAA AGGGCCGC		GCGGCCCT C CTTCCTAC	
1089	UGAGUAGG CUGAUGAG X CGAA AGGAGGGC		GCCCTCCT T CCTACTCA	
1090	CUGAGUAG CUGAUGAG X CGAA AAGGAGGG		CCCTCCTT C CTACTCAG	
1093	GAGCUGAG CUGAUGAG X CGAA AGGAAGGA		TCCTTCCT A CTCAGCTC	
1096	AGAGAGCU CUGAUGAG X CGAA AGUAGGAA		TTCCTACT C AGCTCTCT	
1101	GCCUCAGA CUGAUGAG X CGAA AGCUGAGU		ACTCAGCT C TCTGAGGC	
1103	GGGCCUCA CUGAUGAG X CGAA AGAGCUGA		TCAGCTCT C TGAGGCCC	
1127	GAGCCUCC CUGAUGAG X CGAA AGCGCCAG		CTGGCGCT C GGAGGCTC	
1135	GUCUCCAC CUGAUGAG X CGAA AGCCUCCG		CGGAGGCT C GTGGAGAC	
1147	CCCAGAAA CUGAUGAG X CGAA AUGGUCUC		GAGACCAT C TTTCTGGG	
1149	AACCCAGA CUGAUGAG X CGAA AGAUGGUC		GACCATCT T TCTGGGTT	
1150	GAACCCAG CUGAUGAG X CGAA AAGAUGGU		ACCATCTT T CTGGGTTC	
1151	GGAACCCA CUGAUGAG X CGAA AAAGAUGG		CCATCTTT C TGGGTTCC	
1157	GGGCCUGG CUGAUGAG X CGAA ACCCAGAA		TTCTGGGT T CCAGGCCC	
1158	AGGGCCUG CUGAUGAG X CGAA AACCCAGA		TCTGGGTT C CAGGCCCT	
1181	CCUGCGGG CUGAUGAG X CGAA AGUCCCUG		CAGGGACT C CCCGCAGG	
1191	GGCGGGGC CUGAUGAG X CGAA ACCUGCGG		CCGCAGGT T GCCCCGCC	
1212	UUUGCCAG CUGAUGAG X CGAA AGCGCUGG		CCAGCGCT A CTGGCAAA	
1233	GCUCCAGA CUGAUGAG X CGAA ACAGGGGC		GCCCCTGT T TCTGGAGC	
1234	AGCUCCAG CUGAUGAG X CGAA AACAGGGG		CCCCTGTT T CTGGAGCT	
1235	CAGCUCCA CUGAUGAG X CGAA AAACAGGG		CCCTGTTT C TGGAGCTG	
1246	UGGUUCCC CUGAUGAG X CGAA AGCAGCUC		GAGCTGCT T GGGAACCA	
1269	GCACCCCG CUGAUGAG X CGAA AGGGGCAC		GTGCCCCT A CGGGGTGC	
1279	GUCUUGAG CUGAUGAG X CGAA AGCACCCC		GGGGTGCT C CTCAAGAC	
1282	UGCGUCUU CUGAUGAG X CGAA AGGAGCAC		GTGCTCCT C AAGACGCA	
1312	GCUGGGGU CUGAUGAG X CGAA ACCGCAGC		GCTGCGGT C ACCCCAGC	
1330	CGGGCACA CUGAUGAG X CGAA ACACCGGC		GCCGGTGT C TGTGCCCG	
1356	CCGCCACA CUGAUGAG X CGAA AGCCCUGG		CCAGGGCT C TGTGGCGG	

Table 13

1394	CACCAGGC CUGAUGAG X CGAA ACGGGGGU		ACCCCCGT C GCCTGGTG	
1411	UGCUGGCG CUGAUGAG X CGAA AGCAGCUG		CAGCTGCT C CGCCAGCA	
1440	CGAAGCCG CUGAUGAG X CGAA ACACCUGC		GCAGGTGT A CGGCTTCG	
1446	CCCGCACG CUGAUGAG X CGAA AGCCGUAC		GTACGGCT T CGTGCGGG	
1447	GCCCGCAC CUGAUGAG X CGAA AAGCCGUA		TACGGCTT C GTGCGGGC	
1486	GAGCCCCA CUGAUGAG X CGAA AGGCCUGG		CCAGGCCT C TGGGGCTC	
1494	UGUGCCUG CUGAUGAG X CGAA AGCCCCAG		CTGGGGCT C CAGGCACA	
1515	UCCUGAGG CUGAUGAG X CGAA AGCGGCGU		ACGCCGCT T CCTCAGGA	
1516	UUCCUGAG CUGAUGAG X CGAA AAGCGGCG		CGCCGCTT C CTCAGGAA	
1519	GUGUUCCU CUGAUGAG X CGAA AGGAAGCG		CGCTTCCT C AGGAACAC	
1536	GGGAGAUG CUGAUGAG X CGAA ACUUCUUG		CAAGAAGT T CATCTCCC	
1537	AGGGAGAU CUGAUGAG X CGAA AACUUCUU		AAGAAGTT C ATCTCCCT	
1540	CCCAGGGA CUGAUGAG X CGAA AUGAACUU		AAGTTCAT C TCCCTGGG	
1542	UCCCCAGG CUGAUGAG X CGAA AGAUGAAC		GTTCATCT C CCTGGGGA	
1564	UGCAGCGA CUGAUGAG X CGAA AGCUUGGC		GCCAAGCT C TCGCTGCA	
1566	CCUGCAGC CUGAUGAG X CGAA AGAGCUUG		CAAGCTCT C GCTGCAGG	
1610	GCGCAGCC CUGAUGAG X CGAA AGCGCAGU		ACTGCGCT T GGCTGCGC	
1633	ACACAGCC CUGAUGAG X CGAA ACCCCUGG		CCAGGGGT T GGCTGTGT	
1642	GCGGCCGG CUGAUGAG X CGAA ACACAGCC		GGCTGTGT T CCGGCCGC	
1643	UGCGGCCG CUGAUGAG X CGAA AACACAGC		GCTGTGTT C CGGCCGCA	
1661	CUCACGCA CUGAUGAG X CGAA ACGGUGCU		AGCACCGT C TGCGTGAG	
1675	UUGGCCAG CUGAUGAG X CGAA AUCUCCUC		GAGGAGAT C CTGGCCAA	
1686	AGUGCAGG CUGAUGAG X CGAA ACUUGGCC		GGCCAAGT T CCTGCACT	
1687	CAGUGCAG CUGAUGAG X CGAA AACUUGGC		GCCAAGTT C CTGCACTG	
1710	CGACGACG CUGAUGAG X CGAA ACACACUC		GAGTGTGT A CGTCGTCG	
1714	AGCUCGAC CUGAUGAG X CGAA ACGUACAC		GTGTACGT C GTCGAGCT	
1717	AGCAGCUC CUGAUGAG X CGAA ACGACGUA		TACGTCGT C GAGCTGCT	
1726	AAAGACCU CUGAUGAG X CGAA AGCAGCUC		GAGCTGCT C AGGTCTTT	
1731	AAAAGAAA CUGAUGAG X CGAA ACCUGAGC		GCTCAGGT C TTTCTTTT	
1733	AUAAAAGA CUGAUGAG X CGAA AGACCUGA		TCAGGTCT T TCTTTTAT	
1734	CAUAAAAG CUGAUGAG X CGAA AAGACCUG		CAGGTCTT T CTTTTATG	
1735	ACAUAAAA CUGAUGAG X CGAA AAAGACCU		AGGTCTTT C TTTTATGT	
1737	UGACAUAA CUGAUGAG X CGAA AGAAAGAC		GTCTTTCT T TTATGTCA	
1738	GUGACAUA CUGAUGAG X CGAA AAGAAAGA		TCTTTCTT T TATGTCAC	
1739	CGUGACAU CUGAUGAG X CGAA AAAGAAAG		CTTTCTTT T ATGTCACG	
1740	CCGUGACA CUGAUGAG X CGAA AAAAGAAA		TTTCTTTT A TGTCACGG	
1744	GUCUCCGU CUGAUGAG X CGAA ACAUAAAA		TTTTATGT C ACGGAGAC	
1758	UCUUUUGA CUGAUGAG X CGAA ACGUGGUC		GACCACGT T TCAAAAGA	
1759	UUCUUUUG CUGAUGAG X CGAA AACGUGGU		ACCACGTT T CAAAAGAA	
1760	GUUCUUUU CUGAUGAG X CGAA AAACGUGG		CCACGTTT C AAAAGAAC	
1774	UAGAAAAA CUGAUGAG X CGAA AGCCUGUU		AACAGGCT C TTTTTCTA	
1776	GGUAGAAA CUGAUGAG X CGAA AGAGCCUG		CAGGCTCT T TTTCTACC	
1777	CGGUAGAA CUGAUGAG X CGAA AAGAGCCU		AGGCTCTT T TTCTACCG	
1778	CCGGUAGA CUGAUGAG X CGAA AAAGAGCC		GGCTCTTT T TCTACCGG	
1779	UCCGGUAG CUGAUGAG X CGAA AAAAGAGC		GCTCTTTT T CTACCGGA	
1780	UUCCGGUA CUGAUGAG X CGAA AAAAAGAG		CTCTTTTT C TACCGGAA	
1782	UCUUCCGG CUGAUGAG X CGAA AGAAAAAG		CTTTTTCT A CCGGAAGA	

Table 13

1795	UUGCUCCA CUGAUGAG X CGAA ACACUCUU		AAGAGTGT C TGGAGCAA	
1806	UGCUUUGC CUGAUGAG X CGAA ACUUGCUC		GAGCAAGT T GCAAAGCA	
1816	CUGAUUCC CUGAUGAG X CGAA AUGCUUUG		CAAAGCAT T GGAATCAG	
1822	UGCUGUCU CUGAUGAG X CGAA AUUCCAAU		ATTGGAAT C AGACAGCA	
1833	CCCUCUUC CUGAUGAG X CGAA AGUGCUGU		ACAGCACT T GAAGAGGG	
1860	CUGCUUCC CUGAUGAG X CGAA ACAGCUCC		GGAGCTGT C GGAAGCAG	
1873	UGCUGCCU CUGAUGAG X CGAA ACCUCUGC		GCAGAGGT C AGGCAGCA	
1883	GGCUUCCC CUGAUGAG X CGAA AUGCUGCC		GGCAGCAT C GGGAAGCC	
1911	GGAGUCUG CUGAUGAG X CGAA ACGUCAGC		GCTGACGT C CAGACTCC	
1918	AUGAAGCG CUGAUGAG X CGAA AGUCUGGA		TCCAGACT C CGCTTCAT	
1923	UGGGGAUG CUGAUGAG X CGAA AGCGGAGU		ACTCCGCT T CATCCCCA	
1924	UUGGGGAU CUGAUGAG X CGAA AAGCGGAG		CTCCGCTT C ATCCCCAA	
1927	GGCUUGGG CUGAUGAG X CGAA AUGAAGCG		CGCTTCAT C CCCAAGCC	
1954	AUGUUCAC CUGAUGAG X CGAA AUCGGCCG		CGGCCGAT T GTGAACAT	
1968	CCACGACG CUGAUGAG X CGAA AGUCCAUG		CATGGACT A CGTCGTGG	
1972	GCUCCCAC CUGAUGAG X CGAA ACGUAGUC		GACTACGT C GTGGGAGC	
1989	CUCUGCGG CUGAUGAG X CGAA ACGUUCUG		CAGAACGT T CCGCAGAG	
1990	UCUCUGCG CUGAUGAG X CGAA AACGUUCU		AGAACGTT C CGCAGAGA	
2015	CGAGGUGA CUGAUGAG X CGAA ACGCUCGG		CCGAGCGT C TCACCTCG	
2017	CUCGAGGU CUGAUGAG X CGAA AGACGCUC		GAGCGTCT C ACCTCGAG	
2022	UCACCCUC CUGAUGAG X CGAA AGGUGAGA		TCTCACCT C GAGGGTGA	
2040	GCACGCUG CUGAUGAG X CGAA ACAGUGCC		GGCACTGT T CAGCGTGC	
2041	AGCACGCU CUGAUGAG X CGAA AACAGUGC		GCACTGTT C AGCGTGCT	
2050	UCGUAGUU CUGAUGAG X CGAA AGCACGCU		AGCGTGCT C AACTACGA	
2055	CCCGCUCG CUGAUGAG X CGAA AGUUGAGC		GCTCAACT A CGAGCGGG	
2080	GCGCCCAG CUGAUGAG X CGAA AGGCCGGG		CCCGGCCT C CTGGGCGC	
2091	CCAGCACA CUGAUGAG X CGAA AGGCGCCC		GGGCGCCT C TGTGCTGG	
2111	CCUGUGGA CUGAUGAG X CGAA AUCGUCCA		TGGACGAT A TCCACAGG	
2113	GCCCUGUG CUGAUGAG X CGAA AUAUCGUC		GACGATAT C CACAGGGC	
2133	GCAGCACG CUGAUGAG X CGAA AGGUGCGC		GCGCACCT T CGTGCTGC	
2134	CGCAGCAC CUGAUGAG X CGAA AAGGUGCG		CGCACCTT C GTGCTGCG	
2175	UGACAAAG CUGAUGAG X CGAA ACAGCUCA		TGAGCTGT A CTTTGTCA	
2178	CCUUGACA CUGAUGAG X CGAA AGUACAGC		GCTGTACT T TGTCAAGG	
2179	ACCUUGAC CUGAUGAG X CGAA AAGUACAG		CTGTACTT T GTCAAGGT	
2182	UCCACCUU CUGAUGAG X CGAA ACAAAGUA		TACTTTGT C AAGGTGGA	
2205	UGGUGUCG CUGAUGAG X CGAA ACGCGCCC		GGGCGCGT A CGACACCA	
2215	UCCUGGGG CUGAUGAG X CGAA AUGGUGUC		GACACCAT C CCCCAGGA	
2230	ACCUCCGU CUGAUGAG X CGAA AGCCUGUC		GACAGGCT C ACGGAGGT	
2239	CUGGCGAU CUGAUGAG X CGAA ACCUCCGU		ACGGAGGT C ATCGCCAG	
2242	AUGCUGGC CUGAUGAG X CGAA AUGACCUC		GAGGTCAT C GCCAGCAT	
2251	GGUUUGAU CUGAUGAG X CGAA AUGCUGGC		GCCAGCAT C ATCAAACC	
2254	UGGGGUUU CUGAUGAG X CGAA AUGAUGCU		AGCATCAT C AAACCCCA	
2271	GCACGCAG CUGAUGAG X CGAA ACGUGUUC		GAACACGT A CTGCGTGC	
2282	GGCAUACC CUGAUGAG X CGAA ACGCACGC		GCGTGCGT C GGTATGCC	
2286	CCACGGCA CUGAUGAG X CGAA ACCGACGC		GCGTCGGT A TGCCGTGG	
2296	GCCUUCUG CUGAUGAG X CGAA ACCACGGC		GCCGTGGT C CAGAAGGC	
2320	GCCUUGCG CUGAUGAG X CGAA ACGUGCCC		GGGCACGT C CGCAAGGC	

Table 13

2331	GGCUCUUG CUGAUGAG X CGAA AGGCCUUG		CAAGGCCT T CAAGAGCC	
2332	UGGCUCUU CUGAUGAG X CGAA AAGGCCUU		AAGGCCTT C AAGAGCCA	
2344	AAGGUAGA CUGAUGAG X CGAA ACGUGGCU		AGCCACGT C TCTACCTT	
2346	UCAAGGUA CUGAUGAG X CGAA AGACGUGG		CCACGTCT C TACCTTGA	
2348	UGUCAAGG CUGAUGAG X CGAA AGAGACGU		ACGTCTCT A CCTTGACA	
2352	GGUCUGUC CUGAUGAG X CGAA AGGUAGAG		CTCTACCT T GACAGACC	
2362	UACGGCUG CUGAUGAG X CGAA AGGUCUGU		ACAGACCT C CAGCCGTA	
2370	GUCGCAUG CUGAUGAG X CGAA ACGGCUGG		CCAGCCGT A CATGCGAC	
2382	GAGCCACG CUGAUGAG X CGAA ACUGUCGC		GCGACAGT T CGTGGCTC	
2383	UGAGCCAC CUGAUGAG X CGAA AACUGUCG		CGACAGTT C GTGGCTCA	
2390	CUGCAGGU CUGAUGAG X CGAA AGCCACGA		TCGTGGCT C ACCTGCAG	
2425	UCGAUGAC CUGAUGAG X CGAA ACGGCAUC		GATGCCGT C GTCATCGA	
2428	UGCUCGAU CUGAUGAG X CGAA ACGACGGC		GCCGTCGT C ATCGAGCA	
2431	CUCUGCUC CUGAUGAG X CGAA AUGACGAC		GTCGTCAT C GAGCAGAG	
2442	UCAGGGAG CUGAUGAG X CGAA AGCUCUGC		GCAGAGCT C CTCCCTGA	
2445	CAUUCAGG CUGAUGAG X CGAA AGGAGCUC		GAGCTCCT C CCTGAATG	
2470	ACGUCGAA CUGAUGAG X CGAA AGGCCACU		AGTGGCCT C TTCGACGT	
2472	AGACGUCG CUGAUGAG X CGAA AGAGGCCA		TGGCCTCT T CGACGTCT	
2473	AAGACGUC CUGAUGAG X CGAA AAGAGGCC		GGCCTCTT C GACGTCTT	
2479	CGUAGGAA CUGAUGAG X CGAA ACGUCGAA		TTCGACGT C TTCCTACG	
2481	AGCGUAGG CUGAUGAG X CGAA AGACGUCG		CGACGTCT T CCTACGCT	
2482	AAGCGUAG CUGAUGAG X CGAA AAGACGUC		GACGTCTT C CTACGCTT	
2485	AUGAAGCG CUGAUGAG X CGAA AGGAAGAC		GTCTTCCT A CGCTTCAT	
2490	GGCACAUG CUGAUGAG X CGAA AGCGUAGG		CCTACGCT T CATGTGCC	
2491	UGGCACAU CUGAUGAG X CGAA AAGCGUAG		CTACGCTT C ATGTGCCA	
2515	UUGCCCCU CUGAUGAG X CGAA AUGCGCAC		GTGCGCAT C AGGGGCAA	
2526	GGACGUAG CUGAUGAG X CGAA ACUUGCCC		GGGCAAGT C CTACGTCC	
2529	ACUGGACG CUGAUGAG X CGAA AGGACUUG		CAAGTCCT A CGTCCAGT	
2533	UGGCACUG CUGAUGAG X CGAA ACGUAGGA		TCCTACGT C CAGTGCCA	
2548	CCCUGCGG CUGAUGAG X CGAA AUCCCCUG		CAGGGGAT C CCGCAGGG	
2559	AGAGGAUG CUGAUGAG X CGAA AGCCCUGC		GCAGGGCT C CATCCTCT	
2563	GUGGAGAG CUGAUGAG X CGAA AUGGAGCC		GGCTCCAT C CTCTCCAC	
2566	AGCGUGGA CUGAUGAG X CGAA AGGAUGGA		TCCATCCT C TCCACGCT	
2568	GCAGCGUG CUGAUGAG X CGAA AGAGGAUG		CATCCTCT C CACGCTGC	
2578	AGGCUGCA CUGAUGAG X CGAA AGCAGCGU		ACGCTGCT C TGCAGCCT	
2592	UGUCGCCG CUGAUGAG X CGAA AGCACAGG		CCTGTGCT A CGGCGACA	
2616	UCCCCGCA CUGAUGAG X CGAA ACAGCUUG		CAAGCTGT T TGCGGGGA	
2617	AUCCCCGC CUGAUGAG X CGAA AACAGCUU		AAGCTGTT T GCGGGGAT	
2626	UCCCGCCG CUGAUGAG X CGAA AUCCCCGC		GCGGGGAT T CGGCGGGA	
2627	GUCCCGCC CUGAUGAG X CGAA AAUCCCCG		CGGGGATT C GGCGGGAC	
2644	AAACGCAG CUGAUGAG X CGAA AGCAGCCC		GGGCTGCT C CTGCGTTT	
2651	AUCCACCA CUGAUGAG X CGAA ACGCAGGA		TCCTGCGT T TGGTGGAT	
2652	CAUCCACC CUGAUGAG X CGAA AACGCAGG		CCTGCGTT T GGTGGATG	
2663	CAACAAGA CUGAUGAG X CGAA AUCAUCCA		TGGATGAT T TCTTGTTG	
2664	CCAACAAG CUGAUGAG X CGAA AAUCAUCC		GGATGATT T CTTGTTGG	
2665	ACCAACAA CUGAUGAG X CGAA AAAUCAUC		GATGATTT C TTGTTGGT	
2667	UCACCAAC CUGAUGAG X CGAA AGAAAUCA		TGATTTCT T GTTGGTGA	

Table 13

2670	GUGUCACC CUGAUGAG X CGAA ACAAGAAA		TTTCTTGT T GGTGACAC	
2681	GGUGAGGU CUGAUGAG X CGAA AGGUGUCA		TGACACCT C ACCTCACC	
2686	GCGUGGGU CUGAUGAG X CGAA AGGUGAGG		CCTCACCT C ACCCACGC	
2703	UCCUGAGG CUGAUGAG X CGAA AGGUUUUC		GAAAACCT T CCTCAGGA	
2704	GUCCUGAG CUGAUGAG X CGAA AAGGUUUU		AAAACCTT C CTCAGGAC	
2707	AGGGUCCU CUGAUGAG X CGAA AGGAAGGU		ACCTTCCT C AGGACCCT	
2719	ACACCUCG CUGAUGAG X CGAA ACCAGGGU		ACCCTGGT C CGAGGTGT	
2728	UACUCAGG CUGAUGAG X CGAA ACACCUCG		CGAGGTGT C CCTGAGTA	
2736	CGCAGCCA CUGAUGAG X CGAA ACUCAGGG		CCCTGAGT A TGGCTGCG	
2754	UCUUCCGC CUGAUGAG X CGAA AGUUCACC		GGTGAACT T GCGGAAGA	
2775	CUACAGGG CUGAUGAG X CGAA AGUUCACC		GGTGAACT T CCCTGTAG	
2776	UCUACAGG CUGAUGAG X CGAA AAGUUCAC		GTGAACTT C CCTGTAGA	
2782	UCGUCUUC CUGAUGAG X CGAA ACAGGGAA		TTCCCTGT A GAAGACGA	
2810	CUGAACAA CUGAUGAG X CGAA AGCCGUGC		GCACGGCT T TTGTTCAG	
2811	UCUGAACA CUGAUGAG X CGAA AAGCCGUG		CACGGCTT T TGTTCAGA	
2812	AUCUGAAC CUGAUGAG X CGAA AAAGCCGU		ACGGCTTT T GTTCAGAT	
2815	GGCAUCUG CUGAUGAG X CGAA ACAAAAGC		GCTTTTGT T CAGATGCC	
2816	CGGCAUCU CUGAUGAG X CGAA AACAAAAG		CTTTTGTT C AGATGCCG	
2836	CAGGGGAA CUGAUGAG X CGAA AGGCCGUG		CACGGCCT A TTCCCCTG	
2838	ACCAGGGG CUGAUGAG X CGAA AUAGGCCG		CGGCCTAT T CCCCTGGT	
2839	CACCAGGG CUGAUGAG X CGAA AAUAGGCC		GGCCTATT C CCCTGGTG	
2864	GGUCCGGG CUGAUGAG X CGAA AUCCAGCA		TGCTGGAT A CCCGGACC	
2892	AGCUGGAG CUGAUGAG X CGAA AGUCGCUC		GAGCGACT A CTCCAGCT	
2895	CAUAGCUG CUGAUGAG X CGAA AGUAGUCG		CGACTACT C CAGCTATG	
2901	UCCGGGCA CUGAUGAG X CGAA AGCUGGAG		CTCCAGCT A TGCCCGGA	
2913	CUCUGAUG CUGAUGAG X CGAA AGGUCCGG		CCGGACCT C CATCAGAG	
2917	CUGGCUCU CUGAUGAG X CGAA AUGGAGGU		ACCTCCAT C AGAGCCAG	
2927	GAAGGUGA CUGAUGAG X CGAA ACUGGCUC		GAGCCAGT C TCACCTTC	
2929	UUGAAGGU CUGAUGAG X CGAA AGACUGGC		GCCAGTCT C ACCTTCAA	
2934	CGCGGUUG CUGAUGAG X CGAA AGGUGAGA		TCTCACCT T CAACCGCG	
2935	CCGCGGUU CUGAUGAG X CGAA AAGGUGAG		CTCACCTT C AACCGCGG	
2946	CAGCCUUG CUGAUGAG X CGAA AGCCGCGG		CCGCGGCT T CAAGGCTG	
2947	CCAGCCUU CUGAUGAG X CGAA AAGCCGCG		CGCGGCTT C AAGGCTGG	
2969	GAGUUUGC CUGAUGAG X CGAA ACGCAUGU		ACATGCGT C GCAAACTC	
2977	ACCCCAAA CUGAUGAG X CGAA AGUUUGCG		CGCAAACT C TTTGGGGT	
2979	AGACCCCA CUGAUGAG X CGAA AGAGUUUG		CAAACTCT T TGGGGTCT	
2980	AAGACCCC CUGAUGAG X CGAA AAGAGUUU		AAACTCTT T GGGGTCTT	
2986	AGCCGCAA CUGAUGAG X CGAA ACCCCAAA		TTTGGGGT C TTGCGGCT	
2988	UCAGCCGC CUGAUGAG X CGAA AGACCCCA		TGGGGTCT T GCGGCTGA	
3002	CAGGCUGU CUGAUGAG X CGAA ACACUUCA		TGAAGTGT C ACAGCCTG	
3012	AAUCCAGA CUGAUGAG X CGAA ACAGGCUG		CAGCCTGT T TCTGGATT	
3013	AAAUCCAG CUGAUGAG X CGAA AACAGGCU		AGCCTGTT T CTGGATTT	
3014	CAAAUCCA CUGAUGAG X CGAA AAACAGGC		GCCTGTTT C TGGATTTG	
3020	CACCUGCA CUGAUGAG X CGAA AUCCAGAA		TTCTGGAT T TGCAGGTG	
3021	UCACCUGC CUGAUGAG X CGAA AAUCCAGA		TCTGGATT T GCAGGTGA	
3037	ACCGUCUG CUGAUGAG X CGAA AGGCUGUU		AACAGCCT C CAGACGGT	
3058	AUCUUGUA CUGAUGAG X CGAA AUGUUGGU		ACCAACAT C TACAAGAT	

Table 13

3060	GGAUCUUG CUGAUGAG X CGAA AGAUGUUG		CAACATCT A CAAGATCC	
3067	AGCAGGAG CUGAUGAG X CGAA AUCUUGUA		TACAAGAT C CTCCTGCT	
3070	UGCAGCAG CUGAUGAG X CGAA AGGAUCUU		AAGATCCT C CTGCTGCA	
3084	GAAACCUG CUGAUGAG X CGAA ACGCCUGC		GCAGGCGT A CAGGTTTC	
3090	AUGCGUGA CUGAUGAG X CGAA ACCUGUAC		GTACAGGT T TCACGCAT	
3091	CAUGCGUG CUGAUGAG X CGAA AACCUGUA		TACAGGTT T CACGCATG	
3092	ACAUGCGU CUGAUGAG X CGAA AAACCUGU		ACAGGTTT C ACGCATGT	
3112	UGAAAUGG CUGAUGAG X CGAA AGCUGCAG		CTGCAGCT C CCATTTCA	
3117	GCUGAUGA CUGAUGAG X CGAA AUGGGAGC		GCTCCCAT T TCATCAGC	
3118	UGCUGAUG CUGAUGAG X CGAA AAUGGGAG		CTCCCATT T CATCAGCA	
3119	UUGCUGAU CUGAUGAG X CGAA AAAUGGGA		TCCCATTT C ATCAGCAA	
3122	AACUUGCU CUGAUGAG X CGAA AUGAAAUG		CATTTCAT C AGCAAGTT	
3130	UUCUUCCA CUGAUGAG X CGAA ACUUGCUG		CAGCAAGT T TGGAAGAA	
3131	GUUCUUCC CUGAUGAG X CGAA AACUUGCU		AGCAAGTT T GGAAGAAC	
3147	GCAGGAAA CUGAUGAG X CGAA AUGUGGGG		CCCCACAT T TTTCCTGC	
3148	CGCAGGAA CUGAUGAG X CGAA AAUGUGGG		CCCACATT T TTCCTGCG	
3149	GCGCAGGA CUGAUGAG X CGAA AAAUGUGG		CCACATTT T TCCTGCGC	
3150	CGCGCAGG CUGAUGAG X CGAA AAAAUGUG		CACATTTT T CCTGCGCG	
3151	ACGCGCAG CUGAUGAG X CGAA AAAAAUGU		ACATTTTT C CTGCGCGT	
3160	UCAGAGAU CUGAUGAG X CGAA ACGCGCAG		CTGCGCGT C ATCTCTGA	
3163	GUGUCAGA CUGAUGAG X CGAA AUGACGCG		CGCGTCAT C TCTGACAC	
3165	CCGUGUCA CUGAUGAG X CGAA AGAUGACG		CGTCATCT C TGACACGG	
3177	AGCAGAGG CUGAUGAG X CGAA AGGCCGUG		CACGGCCT C CCTCTGCT	
3181	GAGUAGCA CUGAUGAG X CGAA AGGGAGGC		GCCTCCCT C TGCTACTC	
3186	GGAUGGAG CUGAUGAG X CGAA AGCAGAGG		CCTCTGCT A CTCCATCC	
3189	UCAGGAUG CUGAUGAG X CGAA AGUAGCAG		CTGCTACT C CATCCTGA	
3193	GCUUUCAG CUGAUGAG X CGAA AUGGAGUA		TACTCCAT C CTGAAAGC	
3219	CCCCCAGC CUGAUGAG X CGAA ACAUCCCU		AGGGATGT C GCTGGGGG	
3248	GGAGGGCA CUGAUGAG X CGAA AGGGCCGG		CCGGCCCT C TGCCCTCC	
3255	CGGCCUCG CUGAUGAG X CGAA AGGGCAGA		TCTGCCCT C CGAGGCCG	
3288	UGAGCAGG CUGAUGAG X CGAA AUGCUUGG		CCAAGCAT T CCTGCTCA	
3289	UUGAGCAG CUGAUGAG X CGAA AAUGCUUG		CAAGCATT C CTGCTCAA	
3295	GUCAGCUU CUGAUGAG X CGAA AGCAGGAA		TTCCTGCT C AAGCTGAC	
3305	ACGGUGUC CUGAUGAG X CGAA AGUCAGCU		AGCTGACT C GACACCGT	
3316	ACGUAGGU CUGAUGAG X CGAA ACACGGUG		CACCGTGT C ACCTACGT	
3321	GUGGCACG CUGAUGAG X CGAA AGGUGACA		TGTCACCT A CGTGCCAC	
3331	GACCCCAG CUGAUGAG X CGAA AGUGGCAC		GTGCCACT C CTGGGGTC	
3339	UCCUGAGU CUGAUGAG X CGAA ACCCCAGG		CCTGGGGT C ACTCAGGA	
3343	GCUGUCCU CUGAUGAG X CGAA AGUGACCC		GGGTCACT C AGGACAGC	
3368	GAGCUUCC CUGAUGAG X CGAA ACUCAGCU		AGCTGAGT C GGAAGCTC	
3376	GUCCCCGG CUGAUGAG X CGAA AGCUUCCG		CGGAAGCT C CCGGGGAC	
3429	UGAAGUCU CUGAUGAG X CGAA AGGGCAGU		ACTGCCCT C AGACTTCA	
3435	UGGUCUUG CUGAUGAG X CGAA AGUCUGAG		CTCAGACT T CAAGACCA	
3436	AUGGUCUU CUGAUGAG X CGAA AAGUCUGA		TCAGACTT C AAGACCAT	
3445	CAGUCCAG CUGAUGAG X CGAA AUGGUCUU		AAGACCAT C CTGGACTG	
3503	CCCGGCGU CUGAUGAG X CGAA ACAGGGCU		AGCCCTGT C ACGCCGGG	
3514	GGGACGUA CUGAUGAG X CGAA AGCCCGGC		GCCGGGCT C TACGTCCC	

Table 13

3516	CUGGGACG CUGAUGAG X CGAA AGAGCCCG		CGGGCTCT A CGTCCCAG	
3520	CUCCCUGG CUGAUGAG X CGAA ACGUAGAG		CTCTACGT C CCAGGGAG	
3568	AGGCCUCA CUGAUGAG X CGAA ACUCCCAG		CTGGGAGT C TGAGGCCT	
3587	CUCGGCCA CUGAUGAG X CGAA ACACUCAC		GTGAGTGT T TGGCCGAG	
3588	CCUCGGCC CUGAUGAG X CGAA AACACUCA		TGAGTGTT T GGCCGAGG	
3606	UUCAGCCG CUGAUGAG X CGAA ACAUGCAG		CTGCATGT C CGGCTGAA	
3625	CUCAGCCG CUGAUGAG X CGAA ACACUCAG		CTGAGTGT C CGGCTGAG	
3648	CUUGGCUG CUGAUGAG X CGAA ACACUCGC		GCGAGTGT C CAGCCAAG	
3667	GUGUGCUG CUGAUGAG X CGAA ACACUCAG		CTGAGTGT C CAGCACAC	
3683	GAAGUGAA CUGAUGAG X CGAA ACGGCAGG		CCTGCCGT C TTCACTTC	
3685	GGGAAGUG CUGAUGAG X CGAA AGACGGCA		TGCCGTCT T CACTTCCC	
3686	GGGGAAGU CUGAUGAG X CGAA AAGACGGC		GCCGTCTT C ACTTCCCC	
3690	CUGUGGGG CUGAUGAG X CGAA AGUGAAGA		TCTTCACT T CCCCACAG	
3691	CCUGUGGG CUGAUGAG X CGAA AAGUGAAG		CTTCACTT C CCCACAGG	
3708	GUGGAGCC CUGAUGAG X CGAA AGCGCCAG		CTGGCGCT C GGCTCCAC	
3713	CUGGGGUG CUGAUGAG X CGAA AGCCGAGC		GCTCGGCT C CACCCCAG	
3730	GUGAGGAA CUGAUGAG X CGAA AGCUGGCC		GGCCAGCT T TTCCTCAC	
3731	GGUGAGGA CUGAUGAG X CGAA AAGCUGGC		GCCAGCTT T TCCTCACC	
3732	UGGUGAGG CUGAUGAG X CGAA AAAGCUGG		CCAGCTTT T CCTCACCA	
3733	CUGGUGAG CUGAUGAG X CGAA AAAAGCUG		CAGCTTTT C CTCACCAG	
3736	CUCCUGGU CUGAUGAG X CGAA AGGAAAAG		CTTTTCCT C ACCAGGAG	
3752	GGGAGUGG CUGAUGAG X CGAA AGCCGGGC		GCCCGGCT T CCACTCCC	
3753	GGGGAGUG CUGAUGAG X CGAA AAGCCGGG		CCCGGCTT C CACTCCCC	
3758	UAUGUGGG CUGAUGAG X CGAA AGUGGAAG		CTTCCACT C CCCACATA	
3766	ACUAUUCC CUGAUGAG X CGAA AUGUGGGG		CCCCACAT A GGAATAGT	
3772	GGAUGGAC CUGAUGAG X CGAA AUUCCUAU		ATAGGAAT A GTCCATCC	
3775	UGGGGAUG CUGAUGAG X CGAA ACUAUUCC		GGAATAGT C CATCCCCA	
3779	AAUCUGGG CUGAUGAG X CGAA AUGGACUA		TAGTCCAT C CCCAGATT	
3787	CAAUGGCG CUGAUGAG X CGAA AUCUGGGG		CCCCAGAT T CGCCATTG	
3788	ACAAUGGC CUGAUGAG X CGAA AAUCUGGG		CCCAGATT C GCCATTGT	
3794	GGGUGAAC CUGAUGAG X CGAA AUGGCGAA		TTCGCCAT T GTTCACCC	
3797	GAGGGGUG CUGAUGAG X CGAA ACAAUGGC		GCCATTGT T CACCCCTC	
3798	CGAGGGGU CUGAUGAG X CGAA AACAAUGG		CCATTGTT C ACCCCTCG	
3805	GGCAGGGC CUGAUGAG X CGAA AGGGGUGA		TCACCCCT C GCCCTGCC	
3816	AGGCAAAG CUGAUGAG X CGAA AGGGCAGG		CCTGCCCT C CTTTGCCT	
3819	GGAAGGCA CUGAUGAG X CGAA AGGAGGGC		GCCCTCCT T TGCCTTCC	
3820	UGGAAGGC CUGAUGAG X CGAA AAGGAGGG		CCCTCCTT T GCCTTCCA	
3825	GGGGGUGG CUGAUGAG X CGAA AGGCAAAG		CTTTGCCT T CCACCCCC	
3826	UGGGGGUG CUGAUGAG X CGAA AAGGCAAA		TTTGCCTT C CACCCCCA	
3839	UCCACCUG CUGAUGAG X CGAA AUGGUGGG		CCCACCAT C CAGGTGGA	
3873	AAUUCCCA CUGAUGAG X CGAA AGCUCCCA		TGGGAGCT C TGGGAATT	
3881	UCACUCCA CUGAUGAG X CGAA AUUCCCAG		CTGGGAAT T TGGAGTGA	
3882	GUCACUCC CUGAUGAG X CGAA AAUUCCCA		TGGGAATT T GGAGTGAC	
3907	CGCCUGUG CUGAUGAG X CGAA ACAGGGCA		TGCCCTGT A CACAGGCG	
3940	CCCACAGG CUGAUGAG X CGAA ACCCCCAU		ATGGGGGT C CCTGTGGG	
3950	CCCAAUUU CUGAUGAG X CGAA ACCCACAG		CTGTGGGT C AAATTGGG	
3955	CUCCCCCC CUGAUGAG X CGAA AUUUGACC		GGTCAAAT T GGGGGGAG	

Table 13

3977	CAGUAUUU CUGAUGAG X CGAA ACUCCCAC		GTGGGAGT A AAATACTG	
3982	AUAUUCAG CUGAUGAG X CGAA AUUUUACU		AGTAAAAT A CTGAATAT	
3989	AACUCAUA CUGAUGAG X CGAA AUUCAGUA		TACTGAAT A TATGAGTT	
3991	AAAACUCA CUGAUGAG X CGAA AUAUUCAG		CTGAATAT A TGAGTTTT	
3997	AACUGAAA CUGAUGAG X CGAA ACUCAUAU		ATATGAGT T TTTCAGTT	
3998	AAACUGAA CUGAUGAG X CGAA AACUCAUA		TATGAGTT T TTCAGTTT	
3999	AAAACUGA CUGAUGAG X CGAA AAACUCAU		ATGAGTTT T TCAGTTTT	
4000	CAAAACUG CUGAUGAG X CGAA AAAACUCA		TGAGTTTT T CAGTTTTG	
4001	UCAAAACU CUGAUGAG X CGAA AAAAACUC		GAGTTTTT C AGTTTTGA	
4005	UUUUUCAA CUGAUGAG X CGAA ACUGAAAA		TTTTCAGT T TTGAAAAA	
4006	UUUUUUCA CUGAUGAG X CGAA AACUGAAA		TTTCAGTT T TGAAAAAA	
4007	UUUUUUUC CUGAUGAG X CGAA AAACUGAA		TTCAGTTT T GAAAAAAA	

Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II sequence and length (greater than or equal to 2 base-pairs))
Seq1 = TERT (Homo sapiens telomerase reverse transcriptase (TERT) mRNA, 4015 bp); Nakamura *et al.*, Science 277 (5328), 955-959 (1997)

Table 14

Table 14: Human telomerase reverse transcriptase (TERT) NCH Ribozyme and Target Sequence

nt. Position	Ribozyme Sequence	Seq ID Nos	Substrate Sequence	Seq ID Nos
14	GCGCAGCA CUGAUGAG X CGAA IACGCAGC		GCTGCGTC C TGCTGCGC	
15	UGCGCAGC CUGAUGAG X CGAA IGACGCAG		CTGCGTCC T GCTGCGCA	
18	ACGUGCGC CUGAUGAG X CGAA ICAGGACG		CGTCCTGC T GCGCACGT	
23	UUCCCACG CUGAUGAG X CGAA ICGCAGCA		TGCTGCGC A CGTGGGAA	
34	GGGGCCAG CUGAUGAG X CGAA ICUUCCCA		TGGGAAGC C CTGGCCCC	
35	CGGGGCCA CUGAUGAG X CGAA IGCUUCCC		GGGAAGCC C TGGCCCCG	
36	CCGGGGCC CUGAUGAG X CGAA IGGCUUCC		GGAAGCCC T GGCCCCGG	
40	GUGGCCGG CUGAUGAG X CGAA ICCAGGGC		GCCCTGGC C CCGGCCAC	
41	GGUGGCCG CUGAUGAG X CGAA IGCCAGGG		CCCTGGCC C CGGCCACC	
42	GGGUGGCC CUGAUGAG X CGAA IGGCCAGG		CCTGGCCC C GGCCACCC	
46	GCGGGGGU CUGAUGAG X CGAA ICCGGGGC		GCCCCGGC C ACCCCCGC	
47	CGCGGGGG CUGAUGAG X CGAA IGCCGGGG		CCCCGGCC A CCCCCGCG	
49	AUCGCGGG CUGAUGAG X CGAA IUGGCCGG		CCGGCCAC C CCCGCGAT	
50	CAUCGCGG CUGAUGAG X CGAA IGUGGCCG		CGGCCACC C CCGCGATG	
51	GCAUCGCG CUGAUGAG X CGAA IGGUGGCC		GGCCACCC C CGCGATGC	
52	GGCAUCGC CUGAUGAG X CGAA IGGGUGGC		GCCACCCC C GCGATGCC	
60	GAGCGCGC CUGAUGAG X CGAA ICAUCGCG		CGCGATGC C GCGCGCTC	
67	CAGCGGGG CUGAUGAG X CGAA ICGCGCGG		CCGCGCGC T CCCCGCTG	
69	GGCAGCGG CUGAUGAG X CGAA IAGCGCGC		GCGCGCTC C CCGCTGCC	
70	CGGCAGCG CUGAUGAG X CGAA IGAGCGCG		CGCGCTCC C CGCTGCCG	
71	UCGGCAGC CUGAUGAG X CGAA IGGAGCGC		GCGCTCCC C GCTGCCGA	
74	GGCUCGGC CUGAUGAG X CGAA ICGGGGAG		CTCCCCGC T GCCGAGCC	
77	CACGGCUC CUGAUGAG X CGAA ICAGCGGG		CCCGCTGC C GAGCCGTG	
82	GAGCGCAC CUGAUGAG X CGAA ICUCGGCA		TGCCGAGC C GTGCGCTC	
89	CAGCAGGG CUGAUGAG X CGAA ICGCACGG		CCGTGCGC T CCCTGCTG	
91	CGCAGCAG CUGAUGAG X CGAA IAGCGCAC		GTGCGCTC C CTGCTGCG	
92	GCGCAGCA CUGAUGAG X CGAA IGAGCGCA		TGCGCTCC C TGCTGCGC	
93	UGCGCAGC CUGAUGAG X CGAA IGGAGCGC		GCGCTCCC T GCTGCGCA	
96	GGCUGCGC CUGAUGAG X CGAA ICAGGGAG		CTCCCTGC T GCGCAGCC	
101	GUAGUGGC CUGAUGAG X CGAA ICGCAGCA		TGCTGCGC A GCCACTAC	
104	GCGGUAGU CUGAUGAG X CGAA ICUGCGCA		TGCGCAGC C ACTACCGC	
105	CGCGGUAG CUGAUGAG X CGAA IGCUGCGC		GCGCAGCC A CTACCGCG	
107	CUCGCGGU CUGAUGAG X CGAA IUGGCUGC		GCAGCCAC T ACCGCGAG	
110	CACCUCGC CUGAUGAG X CGAA IUAGUGGC		GCCACTAC C GCGAGGTG	
120	CCAGCGGC CUGAUGAG X CGAA ICACCUCG		CGAGGTGC T GCCGCTGG	
123	UGGCCAGC CUGAUGAG X CGAA ICAGCACC		GGTGCTGC C GCTGGCCA	
126	ACGUGGCC CUGAUGAG X CGAA ICGGCAGC		GCTGCCGC T GGCCACGT	
130	ACGAACGU CUGAUGAG X CGAA ICCAGCGG		CCGCTGGC C ACGTTCGT	
131	CACGAACG CUGAUGAG X CGAA IGCCAGCG		CGCTGGCC A CGTTCGTG	
146	GGGCCCCA CUGAUGAG X CGAA ICGCCGCA		TGCGGCGC C TGGGGCCC	
147	GGGGCCCC CUGAUGAG X CGAA IGCGCCGC		GCGGCGCC T GGGGCCCC	
153	AGCCCUGG CUGAUGAG X CGAA ICCCCAGG		CCTGGGGC C CCAGGGCT	
154	CAGCCCUG CUGAUGAG X CGAA IGCCCCAG		CTGGGGCC C CAGGGCTG	

Table 14

155	CCAGCCCU CUGAUGAG X CGAA IGGCCCCA		TGGGGCCC C AGGGCTGG	
156	GCCAGCCC CUGAUGAG X CGAA IGGGCCCC		GGGGCCCC A GGGCTGGC	
161	CAGCCGCC CUGAUGAG X CGAA ICCCUGGG		CCCAGGGC T GGCGGCTG	
168	GCUGCACC CUGAUGAG X CGAA ICCGCCAG		CTGGCGGC T GGTGCAGC	
174	CCCCGCGC CUGAUGAG X CGAA ICACCAGC		GCTGGTGC A GCGCGGGG	
185	AGCCGCCG CUGAUGAG X CGAA IUCCCCGC		GCGGGGAC C CGGCGGCT	
186	AAGCCGCC CUGAUGAG X CGAA IGUCCCCG		CGGGGACC C GGCGGCTT	
193	GCGCGGAA CUGAUGAG X CGAA ICCGCCGG		CCGGCGGC T TTCCGCGC	
197	CAGCGCGC CUGAUGAG X CGAA IAAAGCCG		CGGCTTTC C GCGCGCTG	
204	GGGCCACC CUGAUGAG X CGAA ICGCGCGG		CCGCGCGC T GGTGGCCC	
211	AGGCACUG CUGAUGAG X CGAA ICCACCAG		CTGGTGGC C CAGTGCCT	
212	CAGGCACU CUGAUGAG X CGAA IGCCACCA		TGGTGGCC C AGTGCCTG	
213	CCAGGCAC CUGAUGAG X CGAA IGGCCACC		GGTGGCCC A GTGCCTGG	
218	GCACACCA CUGAUGAG X CGAA ICACUGGG		CCCAGTGC C TGGTGTGC	
219	CGCACACC CUGAUGAG X CGAA IGCACUGG		CCAGTGCC T GGTGTGCG	
231	CGUCCCAG CUGAUGAG X CGAA ICACGCAC		GTGCGTGC C CTGGGACG	
232	GCGUCCCA CUGAUGAG X CGAA IGCACGCA		TGCGTGCC C TGGGACGC	
233	UGCGUCCC CUGAUGAG X CGAA IGGCACGC		GCGTGCCC T GGGACGCA	
241	GGCGGCCG CUGAUGAG X CGAA ICGUCCCA		TGGGACGC A CGGCCGCC	
246	CGGGGGGC CUGAUGAG X CGAA ICCGUGCG		CGCACGGC C GCCCCCCG	
249	CGGCGGGG CUGAUGAG X CGAA ICGGCCGU		ACGGCCGC C CCCCGCCG	
250	GCGGCGGG CUGAUGAG X CGAA IGCGGCCG		CGGCCGCC C CCCGCCGC	
251	GGCGGCGG CUGAUGAG X CGAA IGGCGGCC		GGCCGCCC C CCGCCGCC	
252	GGGCGGCG CUGAUGAG X CGAA IGGGCGGC		GCCGCCCC C CGCCGCCC	
253	GGGGCGGC CUGAUGAG X CGAA IGGGGCGG		CCGCCCCC C GCCGCCCC	
256	GAGGGGGC CUGAUGAG X CGAA ICGGGGGG		CCCCCCGC C GCCCCCTC	
259	AAGGAGGG CUGAUGAG X CGAA ICGGCGGG		CCCGCCGC C CCCTCCTT	
260	GAAGGAGG CUGAUGAG X CGAA IGCGGCGG		CCGCCGCC C CCTCCTTC	
261	GGAAGGAG CUGAUGAG X CGAA IGGCGGCG		CGCCGCCC C CTCCTTCC	
262	CGGAAGGA CUGAUGAG X CGAA IGGGCGGC		GCCGCCCC C TCCTTCCG	
263	GCGGAAGG CUGAUGAG X CGAA IGGGGCGG		CCGCCCCC T CCTTCCGC	
265	UGGCGGAA CUGAUGAG X CGAA IAGGGGGC		GCCCCCTC C TTCCGCCA	
266	CUGGCGGA CUGAUGAG X CGAA IGAGGGGG		CCCCCTCC T TCCGCCAG	
269	CACCUGGC CUGAUGAG X CGAA IAAGGAGG		CCTCCTTC C GCCAGGTG	
272	GGACACCU CUGAUGAG X CGAA ICGGAAGG		CCTTCCGC C AGGTGTCC	
273	AGGACACC CUGAUGAG X CGAA IGCGGAAG		CTTCCGCC A GGTGTCCT	
280	UUCAGGCA CUGAUGAG X CGAA IACACCUG		CAGGTGTC C TGCCTGAA	
281	CUUCAGGC CUGAUGAG X CGAA IGACACCU		AGGTGTCC T GCCTGAAG	
284	CUCCUUCA CUGAUGAG X CGAA ICAGGACA		TGTCCTGC C TGAAGGAG	
285	GCUCCUUC CUGAUGAG X CGAA IGCAGGAC		GTCCTGCC T GAAGGAGC	
294	GGGCCACC CUGAUGAG X CGAA ICUCCUUC		GAAGGAGC T GGTGGCCC	
301	AGCACUCG CUGAUGAG X CGAA ICCACCAG		CTGGTGGC C CGAGTGCT	
302	CAGCACUC CUGAUGAG X CGAA IGCCACCA		TGGTGGCC C GAGTGCTG	
309	GCCUCUGC CUGAUGAG X CGAA ICACUCGG		CCGAGTGC T GCAGAGGC	
312	ACAGCCUC CUGAUGAG X CGAA ICAGCACU		AGTGCTGC A GAGGCTGT	
318	GCUCGCAC CUGAUGAG X CGAA ICCUCUGC		GCAGAGGC T GTGCGAGC	
345	CGAAGGCC CUGAUGAG X CGAA ICACGUUC		GAACGTGC T GGCCTTCG	

Table 14

349	AAGCCGAA CUGAUGAG X CGAA ICCAGCAC		GTGCTGGC C TTCGGCTT	
350	GAAGCCGA CUGAUGAG X CGAA IGCCAGCA		TGCTGGCC T TCGGCTTC	
356	CAGCGCGA CUGAUGAG X CGAA ICCGAAGG		CCTTCGGC T TCGCGCTG	
363	CGUCCAGC CUGAUGAG X CGAA ICGCGAAG		CTTCGCGC T GCTGGACG	
366	CCCCGUCC CUGAUGAG X CGAA ICAGCGCG		CGCGCTGC T GGACGGGG	
376	CCCCCGCG CUGAUGAG X CGAA ICCCCGUC		GACGGGGC C CGCGGGGG	
377	GCCCCCGC CUGAUGAG X CGAA IGCCCCGU		ACGGGGCC C GCGGGGGC	
386	CUCGGGGG CUGAUGAG X CGAA ICCCCCGC		GCGGGGGC C CCCCCGAG	
387	CCUCGGGG CUGAUGAG X CGAA IGCCCCCG		CGGGGGCC C CCCCGAGG	
388	GCCUCGGG CUGAUGAG X CGAA IGGCCCCC		GGGGGCCC C CCCGAGGC	
389	GGCCUCGG CUGAUGAG X CGAA IGGGCCCC		GGGGCCCC C CCGAGGCC	
390	AGGCCUCG CUGAUGAG X CGAA IGGGGCCC		GGGCCCCC C CGAGGCCT	
391	AAGGCCUC CUGAUGAG X CGAA IGGGGGCC		GGCCCCCC C GAGGCCTT	
397	GUGGUGAA CUGAUGAG X CGAA ICCUCGGG		CCCGAGGC C TTCACCAC	
398	GGUGGUGA CUGAUGAG X CGAA IGCCUCGG		CCGAGGCC T TCACCACC	
401	GCUGGUGG CUGAUGAG X CGAA IAAGGCCU		AGGCCTTC A CCACCAGC	
403	ACGCUGGU CUGAUGAG X CGAA IUGAAGGC		GCCTTCAC C ACCAGCGT	
404	CACGCUGG CUGAUGAG X CGAA IGUGAAGG		CCTTCACC A CCAGCGTG	
406	CGCACGCU CUGAUGAG X CGAA IUGGUGAA		TTCACCAC C AGCGTGCG	
407	GCGCACGC CUGAUGAG X CGAA IGUGGUGA		TCACCACC A GCGTGCGC	
416	CAGGUAGC CUGAUGAG X CGAA ICGCACGC		GCGTGCGC A GCTACCTG	
419	GGGCAGGU CUGAUGAG X CGAA ICUGCGCA		TGCGCAGC T ACCTGCCC	
422	GUUGGGCA CUGAUGAG X CGAA IUAGCUGC		GCAGCTAC C TGCCCAAC	
423	UGUUGGGC CUGAUGAG X CGAA IGUAGCUG		CAGCTACC T GCCCAACA	
426	CCGUGUUG CUGAUGAG X CGAA ICAGGUAG		CTACCTGC C CAACACGG	
427	ACCGUGUU CUGAUGAG X CGAA IGCAGGUA		TACCTGCC C AACACGGT	
428	CACCGUGU CUGAUGAG X CGAA IGGCAGGU		ACCTGCCC A ACACGGTG	
431	GGUCACCG CUGAUGAG X CGAA IUUGGGCA		TGCCCAAC A CGGTGACC	
439	AGUGCGUC CUGAUGAG X CGAA IUCACCGU		ACGGTGAC C GACGCACT	
445	CCCCGCAG CUGAUGAG X CGAA ICGUCGGU		ACCGACGC A CTGCGGGG	
447	UCCCCCGC CUGAUGAG X CGAA IUGCGUCG		CGACGCAC T GCGGGGGA	
471	GCAGCAGC CUGAUGAG X CGAA ICCCCCAC		GTGGGGGC T GCTGCTGC	
474	GGCGCAGC CUGAUGAG X CGAA ICAGCCCC		GGGGCTGC T GCTGCGCC	
477	CGCGGCGC CUGAUGAG X CGAA ICAGCAGC		GCTGCTGC T GCGCCGCG	
482	GCCCACGC CUGAUGAG X CGAA ICGCAGCA		TGCTGCGC C GCGTGGGC	
501	GGUGAACC CUGAUGAG X CGAA ICACGUCG		CGACGTGC T GGTTCACC	
507	CCAGCAGG CUGAUGAG X CGAA IAACCAGC		GCTGGTTC A CCTGCTGG	
509	UGCCAGCA CUGAUGAG X CGAA IUGAACCA		TGGTTCAC C TGCTGGCA	
510	GUGCCAGC CUGAUGAG X CGAA IGUGAACC		GGTTCACC T GCTGGCAC	
513	AGCGUGCC CUGAUGAG X CGAA ICAGGUGA		TCACCTGC T GGCACGCT	
517	GCGCAGCG CUGAUGAG X CGAA ICCAGCAG		CTGCTGGC A CGCTGCGC	
521	GAGCGCGC CUGAUGAG X CGAA ICGUGCCA		TGGCACGC T GCGCGCTC	
528	GCACAAAG CUGAUGAG X CGAA ICGCGCAG		CTGCGCGC T CTTTGTGC	
530	CAGCACAA CUGAUGAG X CGAA IAGCGCGC		GCGCGCTC T TTGTGCTG	
537	GAGCCACC CUGAUGAG X CGAA ICACAAAG		CTTTGTGC T GGTGGCTC	
544	CAGCUGGG CUGAUGAG X CGAA ICCACCAG		CTGGTGGC T CCCAGCTG	
546	CGCAGCUG CUGAUGAG X CGAA IAGCCACC		GGTGGCTC C CAGCTGCG	

Table 14

547	GCGCAGCU CUGAUGAG X CGAA IGAGCCAC		GTGGCTCC C AGCTGCGC	
548	GGCGCAGC CUGAUGAG X CGAA IGGAGCCA		TGGCTCCC A GCTGCGCC	
551	GUAGGCGC CUGAUGAG X CGAA ICUGGGAG		CTCCCAGC T GCGCCTAC	
556	ACCUGGUA CUGAUGAG X CGAA ICGCAGCU		AGCTGCGC C TACCAGGT	
557	CACCUGGU CUGAUGAG X CGAA IGCGCAGC		GCTGCGCC T ACCAGGTG	
560	GCACACCU CUGAUGAG X CGAA IUAGGCGC		GCGCCTAC C AGGTGTGC	
561	CGCACACC CUGAUGAG X CGAA IGUAGGCG		CGCCTACC A GGTGTGCG	
573	ACAGCGGC CUGAUGAG X CGAA ICCCGCAC		GTGCGGGC C GCCGCTGT	
576	GGUACAGC CUGAUGAG X CGAA ICGGCCCG		CGGGCCGC C GCTGTACC	
579	GCUGGUAC CUGAUGAG X CGAA ICGGCGGC		GCCGCCGC T GTACCAGC	
584	GCCGAGCU CUGAUGAG X CGAA IUACAGCG		CGCTGTAC C AGCTCGGC	
585	CGCCGAGC CUGAUGAG X CGAA IGUACAGC		GCTGTACC A GCTCGGCG	
588	CAGCGCCG CUGAUGAG X CGAA ICUGGUAC		GTACCAGC T CGGCGCTG	
595	UGAGUGGC CUGAUGAG X CGAA ICGCCGAG		CTCGGCGC T GCCACTCA	
598	GCCUGAGU CUGAUGAG X CGAA ICAGCGCC		GGCGCTGC C ACTCAGGC	
599	GGCCUGAG CUGAUGAG X CGAA IGCAGCGC		GCGCTGCC A CTCAGGCC	
601	CGGGCCUG CUGAUGAG X CGAA IUGGCAGC		GCTGCCAC T CAGGCCCG	
603	GCCGGGCC CUGAUGAG X CGAA IAGUGGCA		TGCCACTC A GGCCCGGC	
607	GGGGGCCG CUGAUGAG X CGAA ICCUGAGU		ACTCAGGC C CGGCCCCC	
608	CGGGGGCC CUGAUGAG X CGAA IGCCUGAG		CTCAGGCC C GGCCCCCG	
612	GUGGCGGG CUGAUGAG X CGAA ICCGGGCC		GGCCCGGC C CCCGCCAC	
613	UGUGGCGG CUGAUGAG X CGAA IGCCGGGC		GCCCGGCC C CCGCCACA	
614	GUGUGGCG CUGAUGAG X CGAA IGGCCGGG		CCCGGCCC C CGCCACAC	
615	CGUGUGGC CUGAUGAG X CGAA IGGGCCGG		CCGGCCCC C GCCACACG	
618	UAGCGUGU CUGAUGAG X CGAA ICGGGGGC		GCCCCCGC C ACACGCTA	
619	CUAGCGUG CUGAUGAG X CGAA IGCGGGGG		CCCCCGCC A CACGCTAG	
621	CACUAGCG CUGAUGAG X CGAA IUGGCGGG		CCCGCCAC A CGCTAGTG	
625	GGUCCACU CUGAUGAG X CGAA ICGUGUGG		CCACACGC T AGTGGACC	
633	GCCUUCGG CUGAUGAG X CGAA IUCCACUA		TAGTGGAC C CCGAAGGC	
634	CGCCUUCG CUGAUGAG X CGAA IGUCCACU		AGTGGACC C CGAAGGCG	
635	ACGCCUUC CUGAUGAG X CGAA IGGUCCAC		GTGGACCC C GAAGGCGT	
645	CGCAUCCC CUGAUGAG X CGAA IACGCCUU		AAGGCGTC T GGGATGCG	
661	UGGUUCCA CUGAUGAG X CGAA ICCCGUUC		GAACGGGC C TGGAACCA	
662	AUGGUUCC CUGAUGAG X CGAA IGCCCGUU		AACGGGCC T GGAACCAT	
668	GACGCUAU CUGAUGAG X CGAA IUUCCAGG		CCTGGAAC C ATAGCGTC	
669	UGACGCUA CUGAUGAG X CGAA IGUUCCAG		CTGGAACC A TAGCGTCA	
677	GGCCUCCC CUGAUGAG X CGAA IACGCUAU		ATAGCGTC A GGGAGGCC	
685	GGGACCCC CUGAUGAG X CGAA ICCUCCCU		AGGGAGGC C GGGGTCCC	
692	GCCCAGGG CUGAUGAG X CGAA IACCCCGG		CCGGGGTC C CCCTGGGC	
693	GGCCCAGG CUGAUGAG X CGAA IGACCCCG		CGGGGTCC C CCTGGGCC	
694	AGGCCCAG CUGAUGAG X CGAA IGGACCCC		GGGGTCCC C CTGGGCCT	
695	CAGGCCCA CUGAUGAG X CGAA IGGGACCC		GGGTCCCC C TGGGCCTG	
696	GCAGGCCC CUGAUGAG X CGAA IGGGGACC		GGTCCCCC T GGGCCTGC	
701	GGCUGGCA CUGAUGAG X CGAA ICCCAGGG		CCCTGGGC C TGCCAGCC	
702	GGGCUGGC CUGAUGAG X CGAA IGCCCAGG		CCTGGGCC T GCCAGCCC	
705	CCGGGGCU CUGAUGAG X CGAA ICAGGCCC		GGGCCTGC C AGCCCCGG	
706	CCCGGGGC CUGAUGAG X CGAA IGCAGGCC		GGCCTGCC A GCCCCGGG	

Table 14

709	GCACCCGG CUGAUGAG X CGAA ICUGGCAG		CTGCCAGC C CCGGGTGC	
710	CGCACCCG CUGAUGAG X CGAA IGCUGGCA		TGCCAGCC C CGGGTGCG	
711	UCGCACCC CUGAUGAG X CGAA IGGCUGGC		GCCAGCCC C GGGTGCGA	
734	GCUGGCAC CUGAUGAG X CGAA ICCCCCGC		GCGGGGGC A GTGCCAGC	
739	CUUCGGCU CUGAUGAG X CGAA ICACUGCC		GGCAGTGC C AGCCGAAG	
740	ACUUCGGC CUGAUGAG X CGAA IGCACUGC		GCAGTGCC A GCCGAAGT	
743	CAGACUUC CUGAUGAG X CGAA ICUGGCAC		GTGCCAGC C GAAGTCTG	
750	GCAACGGC CUGAUGAG X CGAA IACUUCGG		CCGAAGTC T GCCGTTGC	
753	UGGGCAAC CUGAUGAG X CGAA ICAGACUU		AAGTCTGC C GTTGCCCA	
759	GCCUCUUG CUGAUGAG X CGAA ICAACGGC		GCCGTTGC C CAAGAGGC	
760	GGCCUCUU CUGAUGAG X CGAA IGCAACGG		CCGTTGCC C AAGAGGCC	
761	GGGCCUCU CUGAUGAG X CGAA IGGCAACG		CGTTGCCC A AGAGGCCC	
768	CACGCCUG CUGAUGAG X CGAA ICCUCUUG		CAAGAGGC C CAGGCGTG	
769	CCACGCCU CUGAUGAG X CGAA IGCCUCUU		AAGAGGCC C AGGCGTGG	
770	GCCACGCC CUGAUGAG X CGAA IGGCCUCU		AGAGGCCC A GGCGTGGC	
781	UCAGGGGC CUGAUGAG X CGAA ICGCCACG		CGTGGCGC T GCCCCTGA	
784	GGCUCAGG CUGAUGAG X CGAA ICAGCGCC		GGCGCTGC C CCTGAGCC	
785	CGGCUCAG CUGAUGAG X CGAA IGCAGCGC		GCGCTGCC C CTGAGCCG	
786	CCGGCUCA CUGAUGAG X CGAA IGGCAGCG		CGCTGCCC C TGAGCCGG	
787	UCCGGCUC CUGAUGAG X CGAA IGGGCAGC		GCTGCCCC T GAGCCGGA	
792	UCCGCUCC CUGAUGAG X CGAA ICUCAGGG		CCCTGAGC C GGAGCGGA	
804	GCCCAACG CUGAUGAG X CGAA ICGUCCGC		GCGGACGC C CGTTGGGC	
805	UGCCCAAC CUGAUGAG X CGAA IGCGUCCG		CGGACGCC C GTTGGGCA	
813	AGGACCCC CUGAUGAG X CGAA ICCCAACG		CGTTGGGC A GGGGTCCT	
820	UGGGCCCA CUGAUGAG X CGAA IACCCCUG		CAGGGGTC C TGGGCCCA	
821	GUGGGCCC CUGAUGAG X CGAA IGACCCCU		AGGGGTCC T GGGCCCAC	
826	CCCGGGUG CUGAUGAG X CGAA ICCCAGGA		TCCTGGGC C CACCCGGG	
827	GCCCGGGU CUGAUGAG X CGAA IGCCCAGG		CCTGGGCC C ACCCGGGC	
828	UGCCCGGG CUGAUGAG X CGAA IGGCCCAG		CTGGGCCC A CCCGGGCA	
830	CCUGCCCG CUGAUGAG X CGAA IUGGGCCC		GGGCCCAC C CGGGCAGG	
831	UCCUGCCC CUGAUGAG X CGAA IGUGGGCC		GGCCCACC C GGGCAGGA	
836	ACGCGUCC CUGAUGAG X CGAA ICCCGGGU		ACCCGGGC A GGACGCGT	
849	GGUCACUC CUGAUGAG X CGAA IUCCACGC		GCGTGGAC C GAGTGACC	
857	GAAACCAC CUGAUGAG X CGAA IUCACUCG		CGAGTGAC C GTGGTTTC	
866	CACCACAC CUGAUGAG X CGAA IAAACCAC		GTGGTTTC T GTGTGGTG	
877	CUGGCAGG CUGAUGAG X CGAA IACACCAC		GTGGTGTC A CCTGCCAG	
879	GUCUGGCA CUGAUGAG X CGAA IUGACACC		GGTGTCAC C TGCCAGAC	
880	GGUCUGGC CUGAUGAG X CGAA IGUGACAC		GTGTCACC T GCCAGACC	
883	GCGGGUCU CUGAUGAG X CGAA ICAGGUGA		TCACCTGC C AGACCCGC	
884	GGCGGGUC CUGAUGAG X CGAA IGCAGGUG		CACCTGCC A GACCCGCC	
888	CUUCGGCG CUGAUGAG X CGAA IUCUGGCA		TGCCAGAC C CGCCGAAG	
889	UCUUCGGC CUGAUGAG X CGAA IGUCUGGC		GCCAGACC C GCCGAAGA	
892	GCUUCUUC CUGAUGAG X CGAA ICGGGUCU		AGACCCGC C GAAGAAGC	
901	AAAGAGGU CUGAUGAG X CGAA ICUUCUUC		GAAGAAGC C ACCTCTTT	
902	CAAAGAGG CUGAUGAG X CGAA IGCUUCUU		AAGAAGCC A CCTCTTTG	
904	UCCAAAGA CUGAUGAG X CGAA IUGGCUUC		GAAGCCAC C TCTTTGGA	
905	CUCCAAAG CUGAUGAG X CGAA IGUGGCUU		AAGCCACC T CTTTGGAG	

Table 14

907	CCCUCCAA CUGAUGAG X CGAA IAGGUGGC		GCCACCTC T TTGGAGGG	
921	UGCCAGAG CUGAUGAG X CGAA ICGCACCC		GGGTGCGC T CTCTGGCA	
923	CGUGCCAG CUGAUGAG X CGAA IAGCGCAC		GTGCGCTC T CTGGCACG	
925	CGCGUGCC CUGAUGAG X CGAA IAGAGCGC		GCGCTCTC T GGCACGCG	
929	GUGGCGCG CUGAUGAG X CGAA ICCAGAGA		TCTCTGGC A CGCGCCAC	
935	GUGGGAGU CUGAUGAG X CGAA ICGCGUGC		GCACGCGC C ACTCCCAC	
936	GGUGGGAG CUGAUGAG X CGAA IGCGCGUG		CACGCGCC A CTCCCACC	
938	UGGGUGGG CUGAUGAG X CGAA IUGGCGCG		CGCGCCAC T CCCACCCA	
940	GAUGGGUG CUGAUGAG X CGAA IAGUGGCG		CGCCACTC C CACCCATC	
941	GGAUGGGU CUGAUGAG X CGAA IGAGUGGC		GCCACTCC C ACCCATCC	
942	CGGAUGGG CUGAUGAG X CGAA IGGAGUGG		CCACTCCC A CCCATCCG	
944	CACGGAUG CUGAUGAG X CGAA IUGGGAGU		ACTCCCAC C CATCCGTG	
945	CCACGGAU CUGAUGAG X CGAA IGUGGGAG		CTCCCACC C ATCCGTGG	
946	CCCACGGA CUGAUGAG X CGAA IGGUGGGA		TCCCACCC A TCCGTGGG	
949	CGGCCCAC CUGAUGAG X CGAA IAUGGGUG		CACCCATC C GTGGGCCG	
956	GUGCUGGC CUGAUGAG X CGAA ICCCACGG		CCGTGGGC C GCCAGCAC	
959	GUGGUGCU CUGAUGAG X CGAA ICGGCCCA		TGGGCCGC C AGCACCAC	
960	CGUGGUGC CUGAUGAG X CGAA IGCGGCCC		GGGCCGCC A GCACCACG	
963	CCGCGUGG CUGAUGAG X CGAA ICUGGCGG		CCGCCAGC A CCACGCGG	
965	GCCCGCGU CUGAUGAG X CGAA IUGCUGGC		GCCAGCAC C ACGCGGGC	
966	GGCCCGCG CUGAUGAG X CGAA IGUGCUGG		CCAGCACC A CGCGGGCC	
974	GGAUGGGG CUGAUGAG X CGAA ICCCGCGU		ACGCGGGC C CCCCATCC	
975	UGGAUGGG CUGAUGAG X CGAA IGCCCGCG		CGCGGGCC C CCCATCCA	
976	GUGGAUGG CUGAUGAG X CGAA IGGCCCGC		GCGGGCCC C CCATCCAC	
977	UGUGGAUG CUGAUGAG X CGAA IGGGCCCG		CGGGCCCC C CATCCACA	
978	AUGUGGAU CUGAUGAG X CGAA IGGGGCCC		GGGCCCCC C ATCCACAT	
979	GAUGUGGA CUGAUGAG X CGAA IGGGGGCC		GGCCCCCC A TCCACATC	
982	CGCGAUGU CUGAUGAG X CGAA IAUGGGGG		CCCCCATC C ACATCGCG	
983	CCGCGAUG CUGAUGAG X CGAA IGAUGGGG		CCCCATCC A CATCGCGG	
985	GGCCGCGA CUGAUGAG X CGAA IUGGAUGG		CCATCCAC A TCGCGGCC	
993	GACGUGGU CUGAUGAG X CGAA ICCGCGAU		ATCGCGGC C ACCACGTC	
994	GGACGUGG CUGAUGAG X CGAA IGCCGCGA		TCGCGGCC A CCACGTCC	
996	AGGGACGU CUGAUGAG X CGAA IUGGCCGC		GCGGCCAC C ACGTCCCT	
997	CAGGGACG CUGAUGAG X CGAA IGUGGCCG		CGGCCACC A CGTCCCTG	
1002	UGUCCCAG CUGAUGAG X CGAA IACGUGGU		ACCACGTC C CTGGGACA	
1003	GUGUCCCA CUGAUGAG X CGAA IGACGUGG		CCACGTCC C TGGGACAC	
1004	CGUGUCCC CUGAUGAG X CGAA IGGACGUG		CACGTCCC T GGGACACG	
1010	ACAAGGCG CUGAUGAG X CGAA IUCCCAGG		CCTGGGAC A CGCCTTGT	
1014	GGGGACAA CUGAUGAG X CGAA ICGUGUCC		GGACACGC C TTGTCCCC	
1015	GGGGGACA CUGAUGAG X CGAA IGCGUGUC		GACACGCC T TGTCCCCC	
1020	ACACCGGG CUGAUGAG X CGAA IACAAGGC		GCCTTGTC C CCCGGTGT	
1021	UACACCGG CUGAUGAG X CGAA IGACAAGG		CCTTGTCC C CCGGTGTA	
1022	GUACACCG CUGAUGAG X CGAA IGGACAAG		CTTGTCCC C CGGTGTAC	
1023	CGUACACC CUGAUGAG X CGAA IGGGACAA		TTGTCCCC C GGTGTACG	
1033	UUGGUCUC CUGAUGAG X CGAA ICGUACAC		GTGTACGC C GAGACCAA	
1039	AAGUGCUU CUGAUGAG X CGAA IUCUCGGC		GCCGAGAC C AAGCACTT	
1040	GAAGUGCU CUGAUGAG X CGAA IGUCUCGG		CCGAGACC A AGCACTTC	

Table 14

1044	AGAGGAAG CUGAUGAG X CGAA ICUUGGUC		GACCAAGC A CTTCCTCT	
1046	GUAGAGGA CUGAUGAG X CGAA IUGCUUGG		CCAAGCAC T TCCTCTAC	
1049	GGAGUAGA CUGAUGAG X CGAA IAAGUGCU		AGCACTTC C TCTACTCC	
1050	AGGAGUAG CUGAUGAG X CGAA IGAAGUGC		GCACTTCC T CTACTCCT	
1052	UGAGGAGU CUGAUGAG X CGAA IAGGAAGU		ACTTCCTC T ACTCCTCA	
1055	GCCUGAGG CUGAUGAG X CGAA IUAGAGGA		TCCTCTAC T CCTCAGGC	
1057	UCGCCUGA CUGAUGAG X CGAA IAGUAGAG		CTCTACTC C TCAGGCGA	
1058	GUCGCCUG CUGAUGAG X CGAA IGAGUAGA		TCTACTCC T CAGGCGAC	
1060	UUGUCGCC CUGAUGAG X CGAA IAGGAGUA		TACTCCTC A GGCGACAA	
1067	CUGCUCCU CUGAUGAG X CGAA IUCGCCUG		CAGGCGAC A AGGAGCAG	
1074	GCCGCAGC CUGAUGAG X CGAA ICUCCUUG		CAAGGAGC A GCTGCGGC	
1077	AGGGCCGC CUGAUGAG X CGAA ICUGCUCC		GGAGCAGC T GCGGCCCT	
1083	GGAAGGAG CUGAUGAG X CGAA ICCGCAGC		GCTGCGGC C CTCCTTCC	
1084	AGGAAGGA CUGAUGAG X CGAA IGCCGCAG		CTGCGGCC C TCCTTCCT	
1085	UAGGAAGG CUGAUGAG X CGAA IGGCCGCA		TGCGGCCC T CCTTCCTA	
1087	AGUAGGAA CUGAUGAG X CGAA IAGGGCCG		CGGCCCTC C TTCCTACT	
1088	GAGUAGGA CUGAUGAG X CGAA IGAGGGCC		GGCCCTCC T TCCTACTC	
1091	GCUGAGUA CUGAUGAG X CGAA IAAGGAGG		CCTCCTTC C TACTCAGC	
1092	AGCUGAGU CUGAUGAG X CGAA IGAAGGAG		CTCCTTCC T ACTCAGCT	
1095	GAGAGCUG CUGAUGAG X CGAA IUAGGAAG		CTTCCTAC T CAGCTCTC	
1097	CAGAGAGC CUGAUGAG X CGAA IAGUAGGA		TCCTACTC A GCTCTCTG	
1100	CCUCAGAG CUGAUGAG X CGAA ICUGAGUA		TACTCAGC T CTCTGAGG	
1102	GGCCUCAG CUGAUGAG X CGAA IAGCUGAG		CTCAGCTC T CTGAGGCC	
1104	UGGGCCUC CUGAUGAG X CGAA IAGAGCUG		CAGCTCTC T GAGGCCCA	
1110	UCAGGCUG CUGAUGAG X CGAA ICCUCAGA		TCTGAGGC C CAGCCTGA	
1111	GUCAGGCU CUGAUGAG X CGAA IGCCUCAG		CTGAGGCC C AGCCTGAC	
1112	AGUCAGGC CUGAUGAG X CGAA IGGCCUCA		TGAGGCCC A GCCTGACT	
1115	GCCAGUCA CUGAUGAG X CGAA ICUGGGCC		GGCCCAGC C TGACTGGC	
1116	CGCCAGUC CUGAUGAG X CGAA IGCUGGGC		GCCCAGCC T GACTGGCG	
1120	CGAGCGCC CUGAUGAG X CGAA IUCAGGCU		AGCCTGAC T GGCGCTCG	
1126	AGCCUCCG CUGAUGAG X CGAA ICGCCAGU		ACTGGCGC T CGGAGGCT	
1134	UCUCCACG CUGAUGAG X CGAA ICCUCCGA		TCGGAGGC T CGTGGAGA	
1144	AGAAAGAU CUGAUGAG X CGAA IUCUCCAC		GTGGAGAC C ATCTTTCT	
1145	CAGAAAGA CUGAUGAG X CGAA IGUCUCCA		TGGAGACC A TCTTTCTG	
1148	ACCCAGAA CUGAUGAG X CGAA IAUGGUCU		AGACCATC T TTCTGGGT	
1152	UGGAACCC CUGAUGAG X CGAA IAAAGAUG		CATCTTTC T GGGTTCCA	
1159	CAGGGCCU CUGAUGAG X CGAA IAACCCAG		CTGGGTTC C AGGCCCTG	
1160	CCAGGGCC CUGAUGAG X CGAA IGAACCCA		TGGGTTCC A GGCCCTGG	
1164	GCAUCCAG CUGAUGAG X CGAA ICCUGGAA		TTCCAGGC C CTGGATGC	
1165	GGCAUCCA CUGAUGAG X CGAA IGCCUGGA		TCCAGGCC C TGGATGCC	
1166	UGGCAUCC CUGAUGAG X CGAA IGGCCUGG		CCAGGCCC T GGATGCCA	
1173	GAGUCCCU CUGAUGAG X CGAA ICAUCCAG		CTGGATGC C AGGGACTC	
1174	GGAGUCCC CUGAUGAG X CGAA IGCAUCCA		TGGATGCC A GGGACTCC	
1180	CUGCGGGG CUGAUGAG X CGAA IUCCCUGG		CCAGGGAC T CCCCGCAG	
1182	ACCUGCGG CUGAUGAG X CGAA IAGUCCCU		AGGGACTC C CCGCAGGT	
1183	AACCUGCG CUGAUGAG X CGAA IGAGUCCC		GGGACTCC C CGCAGGTT	
1184	CAACCUGC CUGAUGAG X CGAA IGGAGUCC		GGACTCCC C GCAGGTTG	

Table 14

1187	GGGCAACC CUGAUGAG X CGAA ICGGGGAG		CTCCCCGC A GGTTGCCC	
1194	GCAGGCGG CUGAUGAG X CGAA ICAACCUG		CAGGTTGC C CCGCCTGC	
1195	GGCAGGCG CUGAUGAG X CGAA IGCAACCU		AGGTTGCC C CGCCTGCC	
1196	GGGCAGGC CUGAUGAG X CGAA IGGCAACC		GGTTGCCC C GCCTGCCC	
1199	CUGGGGCA CUGAUGAG X CGAA ICGGGGCA		TGCCCCGC C TGCCCCAG	
1200	GCUGGGGC CUGAUGAG X CGAA IGCGGGGC		GCCCCGCC T GCCCCAGC	
1203	AGCGCUGG CUGAUGAG X CGAA ICAGGCGG		CCGCCTGC C CCAGCGCT	
1204	UAGCGCUG CUGAUGAG X CGAA IGCAGGCG		CGCCTGCC C CAGCGCTA	
1205	GUAGCGCU CUGAUGAG X CGAA IGGCAGGC		GCCTGCCC C AGCGCTAC	
1206	AGUAGCGC CUGAUGAG X CGAA IGGGCAGG		CCTGCCCC A GCGCTACT	
1211	UUGCCAGU CUGAUGAG X CGAA ICGCUGGG		CCCAGCGC T ACTGGCAA	
1214	CAUUUGCC CUGAUGAG X CGAA IUAGCGCU		AGCGCTAC T GGCAAATG	
1218	GCCGCAUU CUGAUGAG X CGAA ICCAGUAG		CTACTGGC A AATGCGGC	
1227	GAAACAGG CUGAUGAG X CGAA ICCGCAUU		AATGCGGC C CCTGTTTC	
1228	AGAAACAG CUGAUGAG X CGAA IGCCGCAU		ATGCGGCC C CTGTTTCT	
1229	CAGAAACA CUGAUGAG X CGAA IGGCCGCA		TGCGGCCC C TGTTTCTG	
1230	CCAGAAAC CUGAUGAG X CGAA IGGGCCGC		GCGGCCCC T GTTTCTGG	
1236	GCAGCUCC CUGAUGAG X CGAA IAAACAGG		CCTGTTTC T GGAGCTGC	
1242	UCCCAAGC CUGAUGAG X CGAA ICUCCAGA		TCTGGAGC T GCTTGGGA	
1245	GGUUCCCA CUGAUGAG X CGAA ICAGCUCC		GGAGCTGC T TGGGAACC	
1253	CUGCGCGU CUGAUGAG X CGAA IUUCCCAA		TTGGGAAC C ACGCGCAG	
1254	ACUGCGCG CUGAUGAG X CGAA IGUUCCCA		TGGGAACC A CGCGCAGT	
1260	AGGGGCAC CUGAUGAG X CGAA ICGCGUGG		CCACGCGC A GTGCCCCT	
1265	CCCGUAGG CUGAUGAG X CGAA ICACUGCG		CGCAGTGC C CCTACGGG	
1266	CCCCGUAG CUGAUGAG X CGAA IGCACUGC		GCAGTGCC C CTACGGGG	
1267	ACCCCGUA CUGAUGAG X CGAA IGGCACUG		CAGTGCCC C TACGGGGT	
1268	CACCCCGU CUGAUGAG X CGAA IGGGCACU		AGTGCCCC T ACGGGGTG	
1278	UCUUGAGG CUGAUGAG X CGAA ICACCCCG		CGGGGTGC T CCTCAAGA	
1280	CGUCUUGA CUGAUGAG X CGAA IAGCACCC		GGGTGCTC C TCAAGACG	
1281	GCGUCUUG CUGAUGAG X CGAA IGAGCACC		GGTGCTCC T CAAGACGC	
1283	GUGCGUCU CUGAUGAG X CGAA IAGGAGCA		TGCTCCTC A AGACGCAC	
1290	GCGGGCAG CUGAUGAG X CGAA ICGUCUUG		CAAGACGC A CTGCCCGC	
1292	CAGCGGGC CUGAUGAG X CGAA IUGCGUCU		AGACGCAC T GCCCGCTG	
1295	UCGCAGCG CUGAUGAG X CGAA ICAGUGCG		CGCACTGC C CGCTGCGA	
1296	CUCGCAGC CUGAUGAG X CGAA IGCAGUGC		GCACTGCC C GCTGCGAG	
1299	CAGCUCGC CUGAUGAG X CGAA ICGGGCAG		CTGCCCGC T GCGAGCTG	
1306	GUGACCGC CUGAUGAG X CGAA ICUCGCAG		CTGCGAGC T GCGGTCAC	
1313	UGCUGGGG CUGAUGAG X CGAA IACCGCAG		CTGCGGTC A CCCCAGCA	
1315	GCUGCUGG CUGAUGAG X CGAA IUGACCGC		GCGGTCAC C CCAGCAGC	
1316	GGCUGCUG CUGAUGAG X CGAA IGUGACCG		CGGTCACC C CAGCAGCC	
1317	CGGCUGCU CUGAUGAG X CGAA IGGUGACC		GGTCACCC C AGCAGCCG	
1318	CCGGCUGC CUGAUGAG X CGAA IGGGUGAC		GTCACCCC A GCAGCCGG	
1321	ACACCGGC CUGAUGAG X CGAA ICUGGGGU		ACCCCAGC A GCCGGTGT	
1324	CAGACACC CUGAUGAG X CGAA ICUGCUGG		CCAGCAGC C GGTGTCTG	
1331	CCGGGCAC CUGAUGAG X CGAA IACACCGG		CCGGTGTC T GTGCCCGG	
1336	UUCUCCCG CUGAUGAG X CGAA ICACAGAC		GTCTGTGC C CGGGAGAA	
1337	CUUCUCCC CUGAUGAG X CGAA IGCACAGA		TCTGTGCC C GGGAGAAG	

Table 14

1347	AGCCCUGG CUGAUGAG X CGAA ICUUCUCC		GGAGAAGC C CCAGGGCT	
1348	GAGCCCUG CUGAUGAG X CGAA IGCUUCUC		GAGAAGCC C CAGGGCTC	
1349	AGAGCCCU CUGAUGAG X CGAA IGGCUUCU		AGAAGCCC C AGGGCTCT	
1350	CAGAGCCC CUGAUGAG X CGAA IGGGCUUC		GAAGCCCC A GGGCTCTG	
1355	CGCCACAG CUGAUGAG X CGAA ICCCUGGG		CCCAGGGC T CTGTGGCG	
1357	GCCGCCAC CUGAUGAG X CGAA IAGCCCUG		CAGGGCTC T GTGGCGGC	
1366	UCCUCGGG CUGAUGAG X CGAA ICCGCCAC		GTGGCGGC C CCCGAGGA	
1367	CUCCUCGG CUGAUGAG X CGAA IGCCGCCA		TGGCGGCC C CCGAGGAG	
1368	CCUCCUCG CUGAUGAG X CGAA IGGCCGCC		GGCGGCCC C CGAGGAGG	
1369	UCCUCCUC CUGAUGAG X CGAA IGGGCCGC		GCGGCCCC C GAGGAGGA	
1382	GGGGUCUG CUGAUGAG X CGAA IUCCUCCU		AGGAGGAC A CAGACCCC	
1384	CGGGGGUC CUGAUGAG X CGAA IUGUCCUC		GAGGACAC A GACCCCCG	
1388	GCGACGGG CUGAUGAG X CGAA IUCUGUGU		ACACAGAC C CCCGTCGC	
1389	GGCGACGG CUGAUGAG X CGAA IGUCUGUG		CACAGACC C CCGTCGCC	
1390	AGGCGACG CUGAUGAG X CGAA IGGUCUGU		ACAGACCC C CGTCGCCT	
1391	CAGGCGAC CUGAUGAG X CGAA IGGGUCUG		CAGACCCC C GTCGCCTG	
1397	CUGCACCA CUGAUGAG X CGAA ICGACGGG		CCCGTCGC C TGGTGCAG	
1398	GCUGCACC CUGAUGAG X CGAA IGCGACGG		CCGTCGCC T GGTGCAGC	
1404	GGAGCAGC CUGAUGAG X CGAA ICACCAGG		CCTGGTGC A GCTGCTCC	
1407	GGCGGAGC CUGAUGAG X CGAA ICUGCACC		GGTGCAGC T GCTCCGCC	
1410	GCUGGCGG CUGAUGAG X CGAA ICAGCUGC		GCAGCTGC T CCGCCAGC	
1412	GUGCUGGC CUGAUGAG X CGAA IAGCAGCU		AGCTGCTC C GCCAGCAC	
1415	GCUGUGCU CUGAUGAG X CGAA ICGGAGCA		TGCTCCGC C AGCACAGC	
1416	UGCUGUGC CUGAUGAG X CGAA IGCGGAGC		GCTCCGCC A GCACAGCA	
1419	GGCUGCUG CUGAUGAG X CGAA ICUGGCGG		CCGCCAGC A CAGCAGCC	
1421	GGGGCUGC CUGAUGAG X CGAA IUGCUGGC		GCCAGCAC A GCAGCCCC	
1424	CCAGGGGC CUGAUGAG X CGAA ICUGUGCU		AGCACAGC A GCCCCTGG	
1427	CUGCCAGG CUGAUGAG X CGAA ICUGCUGU		ACAGCAGC C CCTGGCAG	
1428	CCUGCCAG CUGAUGAG X CGAA IGCUGCUG		CAGCAGCC C CTGGCAGG	
1429	ACCUGCCA CUGAUGAG X CGAA IGGCUGCU		AGCAGCCC C TGGCAGGT	
1430	CACCUGCC CUGAUGAG X CGAA IGGGCUGC		GCAGCCCC T GGCAGGTG	
1434	CGUACACC CUGAUGAG X CGAA ICCAGGGG		CCCCTGGC A GGTGTACG	
1445	CCGCACGA CUGAUGAG X CGAA ICCGUACA		TGTACGGC T TCGTGCGG	
1456	CGCAGGCA CUGAUGAG X CGAA ICCCGCAC		GTGCGGGC C TGCCTGCG	
1457	GCGCAGGC CUGAUGAG X CGAA IGCCCGCA		TGCGGGCC T GCCTGCGC	
1460	CCGGCGCA CUGAUGAG X CGAA ICAGGCCC		GGGCCTGC C TGCGCCGG	
1461	GCCGGCGC CUGAUGAG X CGAA IGCAGGCC		GGCCTGCC T GCGCCGGC	
1466	CACCAGCC CUGAUGAG X CGAA ICGCAGGC		GCCTGCGC C GGCTGGTG	
1470	GGGGCACC CUGAUGAG X CGAA ICCGGCGC		GCGCCGGC T GGTGCCCC	
1476	GGCCUGGG CUGAUGAG X CGAA ICACCAGC		GCTGGTGC C CCCAGGCC	
1477	AGGCCUGG CUGAUGAG X CGAA IGCACCAG		CTGGTGCC C CCAGGCCT	
1478	GAGGCCUG CUGAUGAG X CGAA IGGCACCA		TGGTGCCC C CAGGCCTC	
1479	AGAGGCCU CUGAUGAG X CGAA IGGGCACC		GGTGCCCC C AGGCCTCT	
1480	CAGAGGCC CUGAUGAG X CGAA IGGGGCAC		GTGCCCCC A GGCCTCTG	
1484	GCCCCAGA CUGAUGAG X CGAA ICCUGGGG		CCCCAGGC C TCTGGGGC	
1485	AGCCCCAG CUGAUGAG X CGAA IGCCUGGG		CCCAGGCC T CTGGGGCT	
1487	GGAGCCCC CUGAUGAG X CGAA IAGGCCUG		CAGGCCTC T GGGGCTCC	

Table 14

1493	GUGCCUGG CUGAUGAG X CGAA ICCCCAGA		TCTGGGGC T CCAGGCAC	
1495	UUGUGCCU CUGAUGAG X CGAA IAGCCCCA		TGGGGCTC C AGGCACAA	
1496	GUUGUGCC CUGAUGAG X CGAA IGAGCCCC		GGGGCTCC A GGCACAAC	
1500	GUUCGUUG CUGAUGAG X CGAA ICCUGGAG		CTCCAGGC A CAACGAAC	
1502	GCGUUCGU CUGAUGAG X CGAA IUGCCUGG		CCAGGCAC A ACGAACGC	
1511	GAGGAAGC CUGAUGAG X CGAA ICGUUCGU		ACGAACGC C GCTTCCTC	
1514	CCUGAGGA CUGAUGAG X CGAA ICGGCGUU		AACGCCGC T TCCTCAGG	
1517	GUUCCUGA CUGAUGAG X CGAA IAAGCGGC		GCCGCTTC C TCAGGAAC	
1518	UGUUCCUG CUGAUGAG X CGAA IGAAGCGG		CCGCTTCC T CAGGAACA	
1520	GGUGUUCC CUGAUGAG X CGAA IAGGAAGC		GCTTCCTC A GGAACACC	
1526	CUUCUUGG CUGAUGAG X CGAA IUUCCUGA		TCAGGAAC A CCAAGAAG	
1528	AACUUCUU CUGAUGAG X CGAA IUGUUCCU		AGGAACAC C AAGAAGTT	
1529	GAACUUCU CUGAUGAG X CGAA IGUGUUCC		GGAACACC A AGAAGTTC	
1538	CAGGGAGA CUGAUGAG X CGAA IAACUUCU		AGAAGTTC A TCTCCCTG	
1541	CCCCAGGG CUGAUGAG X CGAA IAUGAACU		AGTTCATC T CCCTGGGG	
1543	UUCCCCAG CUGAUGAG X CGAA IAGAUGAA		TTCATCTC C CTGGGGAA	
1544	CUUCCCCA CUGAUGAG X CGAA IGAGAUGA		TCATCTCC C TGGGGAAG	
1545	GCUUCCCC CUGAUGAG X CGAA IGGAGAUG		CATCTCCC T GGGGAAGC	
1554	GCUUGGCA CUGAUGAG X CGAA ICUUCCCC		GGGGAAGC A TGCCAAGC	
1558	GAGAGCUU CUGAUGAG X CGAA ICAUGCUU		AAGCATGC C AAGCTCTC	
1559	CGAGAGCU CUGAUGAG X CGAA IGCAUGCU		AGCATGCC A AGCTCTCG	
1563	GCAGCGAG CUGAUGAG X CGAA ICUUGGCA		TGCCAAGC T CTCGCTGC	
1565	CUGCAGCG CUGAUGAG X CGAA IAGCUUGG		CCAAGCTC T CGCTGCAG	
1569	GCUCCUGC CUGAUGAG X CGAA ICGAGAGC		GCTCTCGC T GCAGGAGC	
1572	UCAGCUCC CUGAUGAG X CGAA ICAGCGAG		CTCGCTGC A GGAGCTGA	
1578	UCCACGUC CUGAUGAG X CGAA ICUCCUGC		GCAGGAGC T GACGTGGA	
1604	CCAAGCGC CUGAUGAG X CGAA IUCCCGCA		TGCGGGAC T GCGCTTGG	
1609	CGCAGCCA CUGAUGAG X CGAA ICGCAGUC		GACTGCGC T TGGCTGCG	
1614	UCCUGCGC CUGAUGAG X CGAA ICCAAGCG		CGCTTGGC T GCGCAGGA	
1619	UGGCUCC CUGAUGAG X CGAA ICGCAGCC		GGCTGCGC A GGAGCCCA	
1625	AACCCCUG CUGAUGAG X CGAA ICUCCUGC		GCAGGAGC C CAGGGGTT	
1626	CAACCCCU CUGAUGAG X CGAA IGCUCCUG		CAGGAGCC C AGGGGTTG	
1627	CCAACCCC CUGAUGAG X CGAA IGGCUCCU		AGGAGCCC A GGGGTTGG	
1637	CGGAACAC CUGAUGAG X CGAA ICCAACCC		GGGTTGGC T GTGTTCCG	
1644	CUGCGGCC CUGAUGAG X CGAA IAACACAG		CTGTGTTC C GGCCGCAG	
1648	UGCUCUGC CUGAUGAG X CGAA ICCGGAAC		GTTCCGGC C GCAGAGCA	
1651	CGGUGCUC CUGAUGAG X CGAA ICGGCCGG		CCGGCCGC A GAGCACCG	
1656	GCAGACGG CUGAUGAG X CGAA ICUCUGCG		CGCAGAGC A CCGTCTGC	
1658	ACGCAGAC CUGAUGAG X CGAA IUGCUCUG		CAGAGCAC C GTCTGCGT	
1662	CCUCACGC CUGAUGAG X CGAA IACGGUGC		GCACCGTC T GCGTGAGG	
1676	CUUGGCCA CUGAUGAG X CGAA IAUCUCCU		AGGAGATC C TGGCCAAG	
1677	ACUUGGCC CUGAUGAG X CGAA IGAUCUCC		GGAGATCC T GGCCAAGT	
1681	AGGAACUU CUGAUGAG X CGAA ICCAGGAU		ATCCTGGC C AAGTTCCT	
1682	CAGGAACU CUGAUGAG X CGAA IGCCAGGA		TCCTGGCC A AGTTCCTG	
1688	CCAGUGCA CUGAUGAG X CGAA IAACUUGG		CCAAGTTC C TGCACTGG	
1689	GCCAGUGC CUGAUGAG X CGAA IGAACUUG		CAAGTTCC T GCACTGGC	
1692	UCAGCCAG CUGAUGAG X CGAA ICAGGAAC		GTTCCTGC A CTGGCTGA	

Table 14

1694	CAUCAGCC CUGAUGAG X CGAA IUGCAGGA		TCCTGCAC T GGCTGATG	
1698	CACUCAUC CUGAUGAG X CGAA ICCAGUGC		GCACTGGC T GATGAGTG	
1722	ACCUGAGC CUGAUGAG X CGAA ICUCGACG		CGTCGAGC T GCTCAGGT	
1725	AAGACCUG CUGAUGAG X CGAA ICAGCUCG		CGAGCTGC T CAGGTCTT	
1727	GAAAGACC CUGAUGAG X CGAA IAGCAGCU		AGCTGCTC A GGTCTTTC	
1732	UAAAAGAA CUGAUGAG X CGAA IACCUGAG		CTCAGGTC T TTCTTTTA	
1736	GACAUAAA CUGAUGAG X CGAA IAAAGACC		GGTCTTTC T TTTATGTC	
1745	GGUCUCCG CUGAUGAG X CGAA IACAUAAA		TTTATGTC A CGGAGACC	
1753	UGAAACGU CUGAUGAG X CGAA IUCUCCGU		ACGGAGAC C ACGTTTCA	
1754	UUGAAACG CUGAUGAG X CGAA IGUCUCCG		CGGAGACC A CGTTTCAA	
1761	UGUUCUUU CUGAUGAG X CGAA IAAACGUG		CACGTTTC A AAAGAACA	
1769	AAAGAGCC CUGAUGAG X CGAA IUUCUUUU		AAAAGAAC A GGCTCTTT	
1773	AGAAAAAG CUGAUGAG X CGAA ICCUGUUC		GAACAGGC T CTTTTTCT	
1775	GUAGAAAA CUGAUGAG X CGAA IAGCCUGU		ACAGGCTC T TTTTCTAC	
1781	CUUCCGGU CUGAUGAG X CGAA IAAAAAGA		TCTTTTTC T ACCGGAAG	
1784	ACUCUUCC CUGAUGAG X CGAA IUAGAAAA		TTTTCTAC C GGAAGAGT	
1796	CUUGCUCC CUGAUGAG X CGAA IACACUCU		AGAGTGTC T GGAGCAAG	
1802	UUGCAACU CUGAUGAG X CGAA ICUCCAGA		TCTGGAGC A AGTTGCAA	
1809	CAAUGCUU CUGAUGAG X CGAA ICAACUUG		CAAGTTGC A AAGCATTG	
1814	GAUUCCAA CUGAUGAG X CGAA ICUUUGCA		TGCAAAGC A TTGGAATC	
1823	GUGCUGUC CUGAUGAG X CGAA IAUUCCAA		TTGGAATC A GACAGCAC	
1827	UCAAGUGC CUGAUGAG X CGAA IUCUGAUU		AATCAGAC A GCACTTGA	
1830	UCUUCAAG CUGAUGAG X CGAA ICUGUCUG		CAGACAGC A CTTGAAGA	
1832	CCUCUUCA CUGAUGAG X CGAA IUGCUGUC		GACAGCAC T TGAAGAGG	
1845	CCCGCAGC CUGAUGAG X CGAA ICACCCUC		GAGGGTGC A GCTGCGGG	
1848	GCUCCCGC CUGAUGAG X CGAA ICUGCACC		GGTGCAGC T GCGGGAGC	
1857	CUUCCGAC CUGAUGAG X CGAA ICUCCCGC		GCGGGAGC T GTCGGAAG	
1867	CUGACCUC CUGAUGAG X CGAA ICUUCCGA		TCGGAAGC A GAGGTCAG	
1874	AUGCUGCC CUGAUGAG X CGAA IACCUCUG		CAGAGGTC A GGCAGCAT	
1878	CCCGAUGC CUGAUGAG X CGAA ICCUGACC		GGTCAGGC A GCATCGGG	
1881	CUUCCCGA CUGAUGAG X CGAA ICUGCCUG		CAGGCAGC A TCGGGAAG	
1891	GCGGGCCU CUGAUGAG X CGAA ICUUCCCG		CGGGAAGC C AGGCCCGC	
1892	GGCGGGCC CUGAUGAG X CGAA IGCUUCCC		GGGAAGCC A GGCCCGCC	
1896	GCAGGGCG CUGAUGAG X CGAA ICCUGGCU		AGCCAGGC C CGCCCTGC	
1897	AGCAGGGC CUGAUGAG X CGAA IGCCUGGC		GCCAGGCC C GCCCTGCT	
1900	GUCAGCAG CUGAUGAG X CGAA ICGGGCCU		AGGCCCGC C CTGCTGAC	
1901	CGUCAGCA CUGAUGAG X CGAA IGCGGGCC		GGCCCGCC C TGCTGACG	
1902	ACGUCAGC CUGAUGAG X CGAA IGGCGGGC		GCCCGCCC T GCTGACGT	
1905	UGGACGUC CUGAUGAG X CGAA ICAGGGCG		CGCCCTGC T GACGTCCA	
1912	CGGAGUCU CUGAUGAG X CGAA IACGUCAG		CTGACGTC C AGACTCCG	
1913	GCGGAGUC CUGAUGAG X CGAA IGACGUCA		TGACGTCC A GACTCCGC	
1917	UGAAGCGG CUGAUGAG X CGAA IUCUGGAC		GTCCAGAC T CCGCTTCA	
1919	GAUGAAGC CUGAUGAG X CGAA IAGUCUGG		CCAGACTC C GCTTCATC	
1922	GGGGAUGA CUGAUGAG X CGAA ICGGAGUC		GACTCCGC T TCATCCCC	
1925	CUUGGGGA CUGAUGAG X CGAA IAAGCGGA		TCCGCTTC A TCCCCAAG	
1928	AGGCUUGG CUGAUGAG X CGAA IAUGAAGC		GCTTCATC C CCAAGCCT	
1929	CAGGCUUG CUGAUGAG X CGAA IGAUGAAG		CTTCATCC C CAAGCCTG	

Table 14

1930	UCAGGCUU CUGAUGAG X CGAA IGGAUGAA		TTCATCCC C AAGCCTGA	
1931	GUCAGGCU CUGAUGAG X CGAA IGGGAUGA		TCATCCCC A AGCCTGAC	
1935	GCCCGUCA CUGAUGAG X CGAA ICUUGGGG		CCCCAAGC C TGACGGGC	
1936	AGCCCGUC CUGAUGAG X CGAA IGCUUGGG		CCCAAGCC T GACGGGCT	
1944	UCGGCCGC CUGAUGAG X CGAA ICCCGUCA		TGACGGGC T GCGGCCGA	
1950	UCACAAUC CUGAUGAG X CGAA ICCGCAGC		GCTGCGGC C GATTGTGA	
1961	GUAGUCCA CUGAUGAG X CGAA IUUCACAA		TTGTGAAC A TGGACTAC	
1967	CACGACGU CUGAUGAG X CGAA IUCCAUGU		ACATGGAC T ACGTCGTG	
1981	AACGUUCU CUGAUGAG X CGAA ICUCCCAC		GTGGGAGC C AGAACGTT	
1982	GAACGUUC CUGAUGAG X CGAA IGCUCCCA		TGGGAGCC A GAACGTTC	
1991	UUCUCUGC CUGAUGAG X CGAA IAACGUUC		GAACGTTC C GCAGAGAA	
1994	CUUUUCUC CUGAUGAG X CGAA ICGGAACG		CGTTCCGC A GAGAAAAG	
2008	AGACGCUC CUGAUGAG X CGAA ICCCUCUU		AAGAGGGC C GAGCGTCT	
2016	UCGAGGUG CUGAUGAG X CGAA IACGCUCG		CGAGCGTC T CACCTCGA	
2018	CCUCGAGG CUGAUGAG X CGAA IAGACGCU		AGCGTCTC A CCTCGAGG	
2020	ACCCUCGA CUGAUGAG X CGAA IUGAGACG		CGTCTCAC C TCGAGGGT	
2021	CACCCUCG CUGAUGAG X CGAA IGUGAGAC		GTCTCACC T CGAGGGTG	
2035	CUGAACAG CUGAUGAG X CGAA ICCUUCAC		GTGAAGGC A CTGTTCAG	
2037	CGCUGAAC CUGAUGAG X CGAA IUGCCUUC		GAAGGCAC T GTTCAGCG	
2042	GAGCACGC CUGAUGAG X CGAA IAACAGUG		CACTGTTC A GCGTGCTC	
2049	CGUAGUUG CUGAUGAG X CGAA ICACGCUG		CAGCGTGC T CAACTACG	
2051	CUCGUAGU CUGAUGAG X CGAA IAGCACGC		GCGTGCTC A ACTACGAG	
2054	CCGCUCGU CUGAUGAG X CGAA IUUGAGCA		TGCTCAAC T ACGAGCGG	
2072	GAGGCCGG CUGAUGAG X CGAA ICGCCGCG		CGCGGCGC C CCGGCCTC	
2073	GGAGGCCG CUGAUGAG X CGAA IGCGCCGC		GCGGCGCC C CGGCCTCC	
2074	AGGAGGCC CUGAUGAG X CGAA IGGCGCCG		CGGCGCCC C GGCCTCCT	
2078	GCCCAGGA CUGAUGAG X CGAA ICCGGGGC		GCCCCGGC C TCCTGGGC	
2079	CGCCCAGG CUGAUGAG X CGAA IGCCGGGG		CCCCGGCC T CCTGGGCG	
2081	GGCGCCCA CUGAUGAG X CGAA IAGGCCGG		CCGGCCTC C TGGGCGCC	
2082	AGGCGCCC CUGAUGAG X CGAA IGAGGCCG		CGGCCTCC T GGGCGCCT	
2089	AGCACAGA CUGAUGAG X CGAA ICGCCCAG		CTGGGCGC C TCTGTGCT	
2090	CAGCACAG CUGAUGAG X CGAA IGCGCCCA		TGGGCGCC T CTGTGCTG	
2092	CCCAGCAC CUGAUGAG X CGAA IAGGCGCC		GGCGCCTC T GTGCTGGG	
2097	CCAGGCCC CUGAUGAG X CGAA ICACAGAG		CTCTGTGC T GGGCCTGG	
2102	AUCGUCCA CUGAUGAG X CGAA ICCCAGCA		TGCTGGGC C TGGACGAT	
2103	UAUCGUCC CUGAUGAG X CGAA IGCCCAGC		GCTGGGCC T GGACGATA	
2114	GGCCCUGU CUGAUGAG X CGAA IAUAUCGU		ACGATATC C ACAGGGCC	
2115	AGGCCCUG CUGAUGAG X CGAA IGAUAUCG		CGATATCC A CAGGGCCT	
2117	CCAGGCCC CUGAUGAG X CGAA IUGGAUAU		ATATCCAC A GGGCCTGG	
2122	GUGCGCCA CUGAUGAG X CGAA ICCCUGUG		CACAGGGC C TGGCGCAC	
2123	GGUGCGCC CUGAUGAG X CGAA IGCCCUGU		ACAGGGCC T GGCGCACC	
2129	CACGAAGG CUGAUGAG X CGAA ICGCCAGG		CCTGGCGC A CCTTCGTG	
2131	AGCACGAA CUGAUGAG X CGAA IUGCGCCA		TGGCGCAC C TTCGTGCT	
2132	CAGCACGA CUGAUGAG X CGAA IGUGCGCC		GGCGCACC T TCGTGCTG	
2139	GCACACGC CUGAUGAG X CGAA ICACGAAG		CTTCGTGC T GCGTGTGC	
2152	GGGUCCUG CUGAUGAG X CGAA ICCCGCAC		GTGCGGGC C CAGGACCC	
2153	CGGGUCCU CUGAUGAG X CGAA IGCCCGCA		TGCGGGCC C AGGACCCG	

Table 14

2154	GCGGGUCC CUGAUGAG X CGAA IGGCCCGC		GCGGGCCC A GGACCCGC	
2159	AGGCGGCG CUGAUGAG X CGAA IUCCUGGG		CCCAGGAC C CGCCGCCT	
2160	CAGGCGGC CUGAUGAG X CGAA IGUCCUGG		CCAGGACC C GCCGCCTG	
2163	GCUCAGGC CUGAUGAG X CGAA ICGGGUCC		GGACCCGC C GCCTGAGC	
2166	ACAGCUCA CUGAUGAG X CGAA ICGGCGGG		CCCGCCGC C TGAGCTGT	
2167	UACAGCUC CUGAUGAG X CGAA IGCGGCGG		CCGCCGCC T GAGCTGTA	
2172	CAAAGUAC CUGAUGAG X CGAA ICUCAGGC		GCCTGAGC T GTACTTTG	
2177	CUUGACAA CUGAUGAG X CGAA IUACAGCU		AGCTGTAC T TTGTCAAG	
2183	AUCCACCU CUGAUGAG X CGAA IACAAAGU		ACTTTGTC A AGGTGGAT	
2210	GGGGAUGG CUGAUGAG X CGAA IUCGUACG		CGTACGAC A CCATCCCC	
2212	UGGGGGAU CUGAUGAG X CGAA IUGUCGUA		TACGACAC C ATCCCCCA	
2213	CUGGGGGA CUGAUGAG X CGAA IGUGUCGU		ACGACACC A TCCCCCAG	
2216	GUCCUGGG CUGAUGAG X CGAA IAUGGUGU		ACACCATC C CCCAGGAC	
2217	UGUCCUGG CUGAUGAG X CGAA IGAUGGUG		CACCATCC C CCAGGACA	
2218	CUGUCCUG CUGAUGAG X CGAA IGGAUGGU		ACCATCCC C CAGGACAG	
2219	CCUGUCCU CUGAUGAG X CGAA IGGGAUGG		CCATCCCC C AGGACAGG	
2220	GCCUGUCC CUGAUGAG X CGAA IGGGGAUG		CATCCCCC A GGACAGGC	
2225	CGUGAGCC CUGAUGAG X CGAA IUCCUGGG		CCCAGGAC A GGCTCACG	
2229	CCUCCGUG CUGAUGAG X CGAA ICCUGUCC		GGACAGGC T CACGGAGG	
2231	GACCUCCG CUGAUGAG X CGAA IAGCCUGU		ACAGGCTC A CGGAGGTC	
2240	GCUGGCGA CUGAUGAG X CGAA IACCUCCG		CGGAGGTC A TCGCCAGC	
2245	AUGAUGCU CUGAUGAG X CGAA ICGAUGAC		GTCATCGC C AGCATCAT	
2246	GAUGAUGC CUGAUGAG X CGAA IGCGAUGA		TCATCGCC A GCATCATC	
2249	UUUGAUGA CUGAUGAG X CGAA ICUGGCGA		TCGCCAGC A TCATCAAA	
2252	GGGUUUGA CUGAUGAG X CGAA IAUGCUGG		CCAGCATC A TCAAACCC	
2255	CUGGGGUU CUGAUGAG X CGAA IAUGAUGC		GCATCATC A AACCCCAG	
2259	UGUUCUGG CUGAUGAG X CGAA IUUUGAUG		CATCAAAC C CCAGAACA	
2260	GUGUUCUG CUGAUGAG X CGAA IGUUUGAU		ATCAAACC C CAGAACAC	
2261	CGUGUUCU CUGAUGAG X CGAA IGGUUUGA		TCAAACCC C AGAACACG	
2262	ACGUGUUC CUGAUGAG X CGAA IGGGUUUG		CAAACCCC A GAACACGT	
2267	GCAGUACG CUGAUGAG X CGAA IUUCUGGG		CCCAGAAC A CGTACTGC	
2273	ACGCACGC CUGAUGAG X CGAA IUACGUGU		ACACGTAC T GCGTGCGT	
2290	UGGACCAC CUGAUGAG X CGAA ICAUACCG		CGGTATGC C GTGGTCCA	
2297	GGCCUUCU CUGAUGAG X CGAA IACCACGG		CCGTGGTC C AGAAGGCC	
2298	CGGCCUUC CUGAUGAG X CGAA IGACCACG		CGTGGTCC A GAAGGCCG	
2305	CCAUGGGC CUGAUGAG X CGAA ICCUUCUG		CAGAAGGC C GCCCATGG	
2308	UGCCCAUG CUGAUGAG X CGAA ICGGCCUU		AAGGCCGC C CATGGGCA	
2309	GUGCCCAU CUGAUGAG X CGAA IGCGGCCU		AGGCCGCC C ATGGGCAC	
2310	CGUGCCCA CUGAUGAG X CGAA IGGCGGCC		GGCCGCCC A TGGGCACG	
2316	UGCGGACG CUGAUGAG X CGAA ICCCAUGG		CCATGGGC A CGTCCGCA	
2321	GGCCUUGC CUGAUGAG X CGAA IACGUGCC		GGCACGTC C GCAAGGCC	
2324	GAAGGCCU CUGAUGAG X CGAA ICGGACGU		ACGTCCGC A AGGCCTTC	
2329	CUCUUGAA CUGAUGAG X CGAA ICCUUGCG		CGCAAGGC C TTCAAGAG	
2330	GCUCUUGA CUGAUGAG X CGAA IGCCUUGC		GCAAGGCC T TCAAGAGC	
2333	GUGGCUCU CUGAUGAG X CGAA IAAGGCCU		AGGCCTTC A AGAGCCAC	
2339	AGAGACGU CUGAUGAG X CGAA ICUCUUGA		TCAAGAGC C ACGTCTCT	
2340	UAGAGACG CUGAUGAG X CGAA IGCUCUUG		CAAGAGCC A CGTCTCTA	

Table 14

2345	CAAGGUAG CUGAUGAG X CGAA IACGUGGC		GCCACGTC T CTACCTTG	
2347	GUCAAGGU CUGAUGAG X CGAA IAGACGUG		CACGTCTC T ACCTTGAC	
2350	UCUGUCAA CUGAUGAG X CGAA IUAGAGAC		GTCTCTAC C TTGACAGA	
2351	GUCUGUCA CUGAUGAG X CGAA IGUAGAGA		TCTCTACC T TGACAGAC	
2356	UGGAGGUC CUGAUGAG X CGAA IUCAAGGU		ACCTTGAC A GACCTCCA	
2360	CGGCUGGA CUGAUGAG X CGAA IUCUGUCA		TGACAGAC C TCCAGCCG	
2361	ACGGCUGG CUGAUGAG X CGAA IGUCUGUC		GACAGACC T CCAGCCGT	
2363	GUACGGCU CUGAUGAG X CGAA IAGGUCUG		CAGACCTC C AGCCGTAC	
2364	UGUACGGC CUGAUGAG X CGAA IGAGGUCU		AGACCTCC A GCCGTACA	
2367	GCAUGUAC CUGAUGAG X CGAA ICUGGAGG		CCTCCAGC C GTACATGC	
2372	CUGUCGCA CUGAUGAG X CGAA IUACGGCU		AGCCGTAC A TGCGACAG	
2379	CCACGAAC CUGAUGAG X CGAA IUCGCAUG		CATGCGAC A GTTCGTGG	
2389	UGCAGGUG CUGAUGAG X CGAA ICCACGAA		TTCGTGGC T CACCTGCA	
2391	CCUGCAGG CUGAUGAG X CGAA IAGCCACG		CGTGGCTC A CCTGCAGG	
2393	CUCCUGCA CUGAUGAG X CGAA IUGAGCCA		TGGCTCAC C TGCAGGAG	
2394	UCUCCUGC CUGAUGAG X CGAA IGUGAGCC		GGCTCACC T GCAGGAGA	
2397	UGGUCUCC CUGAUGAG X CGAA ICAGGUGA		TCACCTGC A GGAGACCA	
2404	AGCGGGCU CUGAUGAG X CGAA IUCUCCUG		CAGGAGAC C AGCCCGCT	
2405	CAGCGGGC CUGAUGAG X CGAA IGUCUCCU		AGGAGACC A GCCCGCTG	
2408	CCUCAGCG CUGAUGAG X CGAA ICUGGUCU		AGACCAGC C CGCTGAGG	
2409	CCCUCAGC CUGAUGAG X CGAA IGCUGGUC		GACCAGCC C GCTGAGGG	
2412	CAUCCCUC CUGAUGAG X CGAA ICGGGCUG		CAGCCCGC T GAGGGATG	
2422	AUGACGAC CUGAUGAG X CGAA ICAUCCCU		AGGGATGC C GTCGTCAT	
2429	CUGCUCGA CUGAUGAG X CGAA IACGACGG		CCGTCGTC A TCGAGCAG	
2436	AGGAGCUC CUGAUGAG X CGAA ICUCGAUG		CATCGAGC A GAGCTCCT	
2441	CAGGGAGG CUGAUGAG X CGAA ICUCUGCU		AGCAGAGC T CCTCCCTG	
2443	UUCAGGGA CUGAUGAG X CGAA IAGCUCUG		CAGAGCTC C TCCCTGAA	
2444	AUUCAGGG CUGAUGAG X CGAA IGAGCUCU		AGAGCTCC T CCCTGAAT	
2446	UCAUUCAG CUGAUGAG X CGAA IAGGAGCU		AGCTCCTC C CTGAATGA	
2447	CUCAUUCA CUGAUGAG X CGAA IGAGGAGC		GCTCCTCC C TGAATGAG	
2448	CCUCAUUC CUGAUGAG X CGAA IGGAGGAG		CTCCTCCC T GAATGAGG	
2458	CCACUGCU CUGAUGAG X CGAA ICCUCAUU		AATGAGGC C AGCAGTGG	
2459	GCCACUGC CUGAUGAG X CGAA IGCCUCAU		ATGAGGCC A GCAGTGGC	
2462	GAGGCCAC CUGAUGAG X CGAA ICUGGCCU		AGGCCAGC A GTGGCCTC	
2468	GUCGAAGA CUGAUGAG X CGAA ICCACUGC		GCAGTGGC C TCTTCGAC	
2469	CGUCGAAG CUGAUGAG X CGAA IGCCACUG		CAGTGGCC T CTTCGACG	
2471	GACGUCGA CUGAUGAG X CGAA IAGGCCAC		GTGGCCTC T TCGACGTC	
2480	GCGUAGGA CUGAUGAG X CGAA IACGUCGA		TCGACGTC T TCCTACGC	
2483	GAAGCGUA CUGAUGAG X CGAA IAAGACGU		ACGTCTTC C TACGCTTC	
2484	UGAAGCGU CUGAUGAG X CGAA IGAAGACG		CGTCTTCC T ACGCTTCA	
2489	GCACAUGA CUGAUGAG X CGAA ICGUAGGA		TCCTACGC T TCATGTGC	
2492	GUGGCACA CUGAUGAG X CGAA IAAGCGUA		TACGCTTC A TGTGCCAC	
2498	GGCGUGGU CUGAUGAG X CGAA ICACAUGA		TCATGTGC C ACCACGCC	
2499	CGGCGUGG CUGAUGAG X CGAA IGCACAUG		CATGTGCC A CCACGCCG	
2501	CACGGCGU CUGAUGAG X CGAA IUGGCACA		TGTGCCAC C ACGCCGTG	
2502	GCACGGCG CUGAUGAG X CGAA IGUGGCAC		GTGCCACC A CGCCGTGC	
2506	AUGCGCAC CUGAUGAG X CGAA ICGUGGUG		CACCACGC C GTGCGCAT	

Table 14

2513	GCCCCUGA CUGAUGAG X CGAA ICGCACGG		CCGTGCGC A TCAGGGGC	
2516	CUUGCCCC CUGAUGAG X CGAA IAUGCGCA		TGCGCATC A GGGGCAAG	
2522	GUAGGACU CUGAUGAG X CGAA ICCCCUGA		TCAGGGGC A AGTCCTAC	
2527	UGGACGUA CUGAUGAG X CGAA IACUUGCC		GGCAAGTC C TACGTCCA	
2528	CUGGACGU CUGAUGAG X CGAA IGACUUGC		GCAAGTCC T ACGTCCAG	
2534	CUGGCACU CUGAUGAG X CGAA IACGUAGG		CCTACGTC C AGTGCCAG	
2535	CCUGGCAC CUGAUGAG X CGAA IGACGUAG		CTACGTCC A GTGCCAGG	
2540	GAUCCCCU CUGAUGAG X CGAA ICACUGGA		TCCAGTGC C AGGGGATC	
2541	GGAUCCCC CUGAUGAG X CGAA IGCACUGG		CCAGTGCC A GGGGATCC	
2549	GCCCUGCG CUGAUGAG X CGAA IAUCCCCU		AGGGGATC C CGCAGGGC	
2550	AGCCCUGC CUGAUGAG X CGAA IGAUCCCC		GGGGATCC C GCAGGGCT	
2553	UGGAGCCC CUGAUGAG X CGAA ICGGGAUC		GATCCCGC A GGGCTCCA	
2558	GAGGAUGG CUGAUGAG X CGAA ICCCUGCG		CGCAGGGC T CCATCCTC	
2560	GAGAGGAU CUGAUGAG X CGAA IAGCCCUG		CAGGGCTC C ATCCTCTC	
2561	GGAGAGGA CUGAUGAG X CGAA IGAGCCCU		AGGGCTCC A TCCTCTCC	
2564	CGUGGAGA CUGAUGAG X CGAA IAUGGAGC		GCTCCATC C TCTCCACG	
2565	GCGUGGAG CUGAUGAG X CGAA IGAUGGAG		CTCCATCC T CTCCACGC	
2567	CAGCGUGG CUGAUGAG X CGAA IAGGAUGG		CCATCCTC T CCACGCTG	
2569	AGCAGCGU CUGAUGAG X CGAA IAGAGGAU		ATCCTCTC C ACGCTGCT	
2570	GAGCAGCG CUGAUGAG X CGAA IGAGAGGA		TCCTCTCC A CGCTGCTC	
2574	UGCAGAGC CUGAUGAG X CGAA ICGUGGAG		CTCCACGC T GCTCTGCA	
2577	GGCUGCAG CUGAUGAG X CGAA ICAGCGUG		CACGCTGC T CTGCAGCC	
2579	CAGGCUGC CUGAUGAG X CGAA IAGCAGCG		CGCTGCTC T GCAGCCTG	
2582	GCACAGGC CUGAUGAG X CGAA ICAGAGCA		TGCTCTGC A GCCTGTGC	
2585	GUAGCACA CUGAUGAG X CGAA ICUGCAGA		TCTGCAGC C TGTGCTAC	
2586	CGUAGCAC CUGAUGAG X CGAA IGCUGCAG		CTGCAGCC T GTGCTACG	
2591	GUCGCCGU CUGAUGAG X CGAA ICACAGGC		GCCTGTGC T ACGGCGAC	
2600	GUUCUCCA CUGAUGAG X CGAA IUCGCCGU		ACGGCGAC A TGGAGAAC	
2609	AAACAGCU CUGAUGAG X CGAA IUUCUCCA		TGGAGAAC A AGCTGTTT	
2613	CCGCAAAC CUGAUGAG X CGAA ICUUGUUC		GAACAAGC T GTTTGCGG	
2640	GCAGGAGC CUGAUGAG X CGAA ICCCGUCC		GGACGGGC T GCTCCTGC	
2643	AACGCAGG CUGAUGAG X CGAA ICAGCCCG		CGGGCTGC T CCTGCGTT	
2645	CAAACGCA CUGAUGAG X CGAA IAGCAGCC		GGCTGCTC C TGCGTTTG	
2646	CCAAACGC CUGAUGAG X CGAA IGAGCAGC		GCTGCTCC T GCGTTTGG	
2666	CACCAACA CUGAUGAG X CGAA IAAAUCAU		ATGATTTC T TGTTGGTG	
2677	AGGUGAGG CUGAUGAG X CGAA IUCACCAA		TTGGTGAC A CCTCACCT	
2679	UGAGGUGA CUGAUGAG X CGAA IUGUCACC		GGTGACAC C TCACCTCA	
2680	GUGAGGUG CUGAUGAG X CGAA IGUGUCAC		GTGACACC T CACCTCAC	
2682	GGGUGAGG CUGAUGAG X CGAA IAGGUGUC		GACACCTC A CCTCACCC	
2684	GUGGGUGA CUGAUGAG X CGAA IUGAGGUG		CACCTCAC C TCACCCAC	
2685	CGUGGGUG CUGAUGAG X CGAA IGUGAGGU		ACCTCACC T CACCCACG	
2687	CGCGUGGG CUGAUGAG X CGAA IAGGUGAG		CTCACCTC A CCCACGCG	
2689	UUCGCGUG CUGAUGAG X CGAA IUGAGGUG		CACCTCAC C CACGCGAA	
2690	UUUCGCGU CUGAUGAG X CGAA IGUGAGGU		ACCTCACC C ACGCGAAA	
2691	UUUUCGCG CUGAUGAG X CGAA IGGUGAGG		CCTCACCC A CGCGAAAA	
2701	CUGAGGAA CUGAUGAG X CGAA IUUUUCGC		GCGAAAAC C TTCCTCAG	
2702	CCUGAGGA CUGAUGAG X CGAA IGUUUUCG		CGAAAACC T TCCTCAGG	

Table 14

2705	GGUCCUGA CUGAUGAG X CGAA IAAGGUUU		AAACCTTC C TCAGGACC	
2706	GGGUCCUG CUGAUGAG X CGAA IGAAGGUU		AACCTTCC T CAGGACCC	
2708	CAGGGUCC CUGAUGAG X CGAA IAGGAAGG		CCTTCCTC A GGACCCTG	
2713	CGGACCAG CUGAUGAG X CGAA IUCCUGAG		CTCAGGAC C CTGGTCCG	
2714	UCGGACCA CUGAUGAG X CGAA IGUCCUGA		TCAGGACC C TGGTCCGA	
2715	CUCGGACC CUGAUGAG X CGAA IGGUCCUG		CAGGACCC T GGTCCGAG	
2720	GACACCUC CUGAUGAG X CGAA IACCAGGG		CCCTGGTC C GAGGTGTC	
2729	AUACUCAG CUGAUGAG X CGAA IACACCUC		GAGGTGTC C CTGAGTAT	
2730	CAUACUCA CUGAUGAG X CGAA IGACACCU		AGGTGTCC C TGAGTATG	
2731	CCAUACUC CUGAUGAG X CGAA IGGACACC		GGTGTCCC T GAGTATGG	
2741	CACCACGC CUGAUGAG X CGAA ICCAUACU		AGTATGGC T GCGTGGTG	
2753	CUUCCGCA CUGAUGAG X CGAA IUUCACCA		TGGTGAAC T TGCGGAAG	
2764	UUCACCAC CUGAUGAG X CGAA IUCUUCCG		CGGAAGAC A GTGGTGAA	
2774	UACAGGGA CUGAUGAG X CGAA IUUCACCA		TGGTGAAC T TCCCTGTA	
2777	UUCUACAG CUGAUGAG X CGAA IAAGUUCA		TGAACTTC C CTGTAGAA	
2778	CUUCUACA CUGAUGAG X CGAA IGAAGUUC		GAACTTCC C TGTAGAAG	
2779	UCUUCUAC CUGAUGAG X CGAA IGGAAGUU		AACTTCCC T GTAGAAGA	
2794	CCACCCAG CUGAUGAG X CGAA ICCUCGUC		GACGAGGC C CTGGGTGG	
2795	GCCACCCA CUGAUGAG X CGAA IGCCUCGU		ACGAGGCC C TGGGTGGC	
2796	UGCCACCC CUGAUGAG X CGAA IGGCCUCG		CGAGGCCC T GGGTGGCA	
2804	AAAAGCCG CUGAUGAG X CGAA ICCACCCA		TGGGTGGC A CGGCTTTT	
2809	UGAACAAA CUGAUGAG X CGAA ICCGUGCC		GGCACGGC T TTTGTTCA	
2817	CCGGCAUC CUGAUGAG X CGAA IAACAAAA		TTTTGTTC A GATGCCGG	
2823	CGUGGGCC CUGAUGAG X CGAA ICAUCUGA		TCAGATGC C GGCCCACG	
2827	AGGCCGUG CUGAUGAG X CGAA ICCGGCAU		ATGCCGGC C CACGGCCT	
2828	UAGGCCGU CUGAUGAG X CGAA IGCCGGCA		TGCCGGCC C ACGGCCTA	
2829	AUAGGCCG CUGAUGAG X CGAA IGGCCGGC		GCCGGCCC A CGGCCTAT	
2834	GGGGAAUA CUGAUGAG X CGAA ICCGUGGG		CCCACGGC C TATTCCCC	
2835	AGGGGAAU CUGAUGAG X CGAA IGCCGUGG		CCACGGCC T ATTCCCCT	
2840	GCACCAGG CUGAUGAG X CGAA IAAUAGGC		GCCTATTC C CCTGGTGC	
2841	CGCACCAG CUGAUGAG X CGAA IGAAUAGG		CCTATTCC C CTGGTGCG	
2842	CCGCACCA CUGAUGAG X CGAA IGGAAUAG		CTATTCCC C TGGTGCGG	
2843	GCCGCACC CUGAUGAG X CGAA IGGGAAUA		TATTCCCC T GGTGCGGC	
2852	CAGCAGCA CUGAUGAG X CGAA ICCGCACC		GGTGCGGC C TGCTGCTG	
2853	CCAGCAGC CUGAUGAG X CGAA IGCCGCAC		GTGCGGCC T GCTGCTGG	
2856	UAUCCAGC CUGAUGAG X CGAA ICAGGCCG		CGGCCTGC T GCTGGATA	
2859	GGGUAUCC CUGAUGAG X CGAA ICAGCAGG		CCTGCTGC T GGATACCC	
2866	AGGGUCCG CUGAUGAG X CGAA IUAUCCAG		CTGGATAC C CGGACCCT	
2867	CAGGGUCC CUGAUGAG X CGAA IGUAUCCA		TGGATACC C GGACCCTG	
2872	ACCUCCAG CUGAUGAG X CGAA IUCCGGGU		ACCCGGAC C CTGGAGGT	
2873	CACCUCCA CUGAUGAG X CGAA IGUCCGGG		CCCGGACC C TGGAGGTG	
2874	GCACCUCC CUGAUGAG X CGAA IGGUCCGG		CCGGACCC T GGAGGTGC	
2883	AGUCGCUC CUGAUGAG X CGAA ICACCUCC		GGAGGTGC A GAGCGACT	
2891	GCUGGAGU CUGAUGAG X CGAA IUCGCUCU		AGAGCGAC T ACTCCAGC	
2894	AUAGCUGG CUGAUGAG X CGAA IUAGUCGC		GCGACTAC T CCAGCTAT	
2896	GCAUAGCU CUGAUGAG X CGAA IAGUAGUC		GACTACTC C AGCTATGC	
2897	GGCAUAGC CUGAUGAG X CGAA IGAGUAGU		ACTACTCC A GCTATGCC	

Table 14

2900	CCGGGCAU CUGAUGAG X CGAA ICUGGAGU		ACTCCAGC T ATGCCCGG	
2905	GAGGUCCG CUGAUGAG X CGAA ICAUAGCU		AGCTATGC C CGGACCTC	
2906	GGAGGUCC CUGAUGAG X CGAA IGCAUAGC		GCTATGCC C GGACCTCC	
2911	CUGAUGGA CUGAUGAG X CGAA IUCCGGGC		GCCCGGAC C TCCATCAG	
2912	UCUGAUGG CUGAUGAG X CGAA IGUCCGGG		CCCGGACC T CCATCAGA	
2914	GCUCUGAU CUGAUGAG X CGAA IAGGUCCG		CGGACCTC C ATCAGAGC	
2915	GGCUCUGA CUGAUGAG X CGAA IGAGGUCC		GGACCTCC A TCAGAGCC	
2918	ACUGGCUC CUGAUGAG X CGAA IAUGGAGG		CCTCCATC A GAGCCAGT	
2923	GUGAGACU CUGAUGAG X CGAA ICUCUGAU		ATCAGAGC C AGTCTCAC	
2924	GGUGAGAC CUGAUGAG X CGAA IGCUCUGA		TCAGAGCC A GTCTCACC	
2928	UGAAGGUG CUGAUGAG X CGAA IACUGGCU		AGCCAGTC T CACCTTCA	
2930	GUUGAAGG CUGAUGAG X CGAA IAGACUGG		CCAGTCTC A CCTTCAAC	
2932	CGGUUGAA CUGAUGAG X CGAA IUGAGACU		AGTCTCAC C TTCAACCG	
2933	GCGGUUGA CUGAUGAG X CGAA IGUGAGAC		GTCTCACC T TCAACCGC	
2936	GCCGCGGU CUGAUGAG X CGAA IAAGGUGA		TCACCTTC A ACCGCGGC	
2939	GAAGCCGC CUGAUGAG X CGAA IUUGAAGG		CCTTCAAC C GCGGCTTC	
2945	AGCCUUGA CUGAUGAG X CGAA ICCGCGGU		ACCGCGGC T TCAAGGCT	
2948	CCCAGCCU CUGAUGAG X CGAA IAAGCCGC		GCGGCTTC A AGGCTGGG	
2953	UUCCUCCC CUGAUGAG X CGAA ICCUUGAA		TTCAAGGC T GGGAGGAA	
2963	GCGACGCA CUGAUGAG X CGAA IUUCCUCC		GGAGGAAC A TGCGTCGC	
2972	AAAGAGUU CUGAUGAG X CGAA ICGACGCA		TGCGTCGC A AACTCTTT	
2976	CCCCAAAG CUGAUGAG X CGAA IUUUGCGA		TCGCAAAC T CTTTGGGG	
2978	GACCCCAA CUGAUGAG X CGAA IAGUUUGC		GCAAACTC T TTGGGGTC	
2987	CAGCCGCA CUGAUGAG X CGAA IACCCCAA		TTGGGGTC T TGCGGCTG	
2994	GACACUUC CUGAUGAG X CGAA ICCGCAAG		CTTGCGGC T GAAGTGTC	
3003	ACAGGCUG CUGAUGAG X CGAA IACACUUC		GAAGTGTC A CAGCCTGT	
3005	AAACAGGC CUGAUGAG X CGAA IUGACACU		AGTGTCAC A GCCTGTTT	
3008	CAGAAACA CUGAUGAG X CGAA ICUGUGAC		GTCACAGC C TGTTTCTG	
3009	CCAGAAAC CUGAUGAG X CGAA IGCUGUGA		TCACAGCC T GTTTCTGG	
3015	GCAAAUCC CUGAUGAG X CGAA IAAACAGG		CCTGTTTC T GGATTTGC	
3024	UGUUCACC CUGAUGAG X CGAA ICAAAUCC		GGATTTGC A GGTGAACA	
3032	CUGGAGGC CUGAUGAG X CGAA IUUCACCU		AGGTGAAC A GCCTCCAG	
3035	CGUCUGGA CUGAUGAG X CGAA ICUGUUCA		TGAACAGC C TCCAGACG	
3036	CCGUCUGG CUGAUGAG X CGAA IGCUGUUC		GAACAGCC T CCAGACGG	
3038	CACCGUCU CUGAUGAG X CGAA IAGGCUGU		ACAGCCTC C AGACGGTG	
3039	ACACCGUC CUGAUGAG X CGAA IGAGGCUG		CAGCCTCC A GACGGTGT	
3050	GAUGUUGG CUGAUGAG X CGAA ICACACCG		CGGTGTGC A CCAACATC	
3052	UAGAUGUU CUGAUGAG X CGAA IUGCACAC		GTGTGCAC C AACATCTA	
3053	GUAGAUGU CUGAUGAG X CGAA IGUGCACA		TGTGCACC A ACATCTAC	
3056	CUUGUAGA CUGAUGAG X CGAA IUUGGUGC		GCACCAAC A TCTACAAG	
3059	GAUCUUGU CUGAUGAG X CGAA IAUGUUGG		CCAACATC T ACAAGATC	
3062	GAGGAUCU CUGAUGAG X CGAA IUAGAUGU		ACATCTAC A AGATCCTC	
3068	CAGCAGGA CUGAUGAG X CGAA IAUCUUGU		ACAAGATC C TCCTGCTG	
3069	GCAGCAGG CUGAUGAG X CGAA IGAUCUUG		CAAGATCC T CCTGCTGC	
3071	CUGCAGCA CUGAUGAG X CGAA IAGGAUCU		AGATCCTC C TGCTGCAG	
3072	CCUGCAGC CUGAUGAG X CGAA IGAGGAUC		GATCCTCC T GCTGCAGG	
3075	ACGCCUGC CUGAUGAG X CGAA ICAGGAGG		CCTCCTGC T GCAGGCGT	

Table 14

3078	UGUACGCC CUGAUGAG X CGAA ICAGCAGG		CCTGCTGC A GGCGTACA	
3086	GUGAAACC CUGAUGAG X CGAA IUACGCCU		AGGCGTAC A GGTTTCAC	
3093	CACAUGCG CUGAUGAG X CGAA IAAACCUG		CAGGTTTC A CGCATGTG	
3097	AGCACACA CUGAUGAG X CGAA ICGUGAAA		TTTCACGC A TGTGTGCT	
3105	GGAGCUGC CUGAUGAG X CGAA ICACACAU		ATGTGTGC T GCAGCTCC	
3108	AUGGGAGC CUGAUGAG X CGAA ICAGCACA		TGTGCTGC A GCTCCCAT	
3111	GAAAUGGG CUGAUGAG X CGAA ICUGCAGC		GCTGCAGC T CCCATTTC	
3113	AUGAAAUG CUGAUGAG X CGAA IAGCUGCA		TGCAGCTC C CATTTCAT	
3114	GAUGAAAU CUGAUGAG X CGAA IGAGCUGC		GCAGCTCC C ATTTCATC	
3115	UGAUGAAA CUGAUGAG X CGAA IGGAGCUG		CAGCTCCC A TTTCATCA	
3120	CUUGCUGA CUGAUGAG X CGAA IAAAUGGG		CCCATTTC A TCAGCAAG	
3123	AAACUUGC CUGAUGAG X CGAA IAUGAAAU		ATTTCATC A GCAAGTTT	
3126	UCCAAACU CUGAUGAG X CGAA ICUGAUGA		TCATCAGC A AGTTTGGA	
3140	AAAUGUGG CUGAUGAG X CGAA IUUCUUCC		GGAAGAAC C CCACATTT	
3141	AAAAUGUG CUGAUGAG X CGAA IGUUCUUC		GAAGAACC C CACATTTT	
3142	AAAAAUGU CUGAUGAG X CGAA IGGUUCUU		AAGAACCC C ACATTTTT	
3143	GAAAAAUG CUGAUGAG X CGAA IGGGUUCU		AGAACCCC A CATTTTTC	
3145	AGGAAAAA CUGAUGAG X CGAA IUGGGGUU		AACCCCAC A TTTTTCCT	
3152	GACGCGCA CUGAUGAG X CGAA IAAAAAUG		CATTTTTC C TGCGCGTC	
3153	UGACGCGC CUGAUGAG X CGAA IGAAAAAU		ATTTTTCC T GCGCGTCA	
3161	GUCAGAGA CUGAUGAG X CGAA IACGCGCA		TGCGCGTC A TCTCTGAC	
3164	CGUGUCAG CUGAUGAG X CGAA IAUGACGC		GCGTCATC T CTGACACG	
3166	GCCGUGUC CUGAUGAG X CGAA IAGAUGAC		GTCATCTC T GACACGGC	
3170	GGAGGCCG CUGAUGAG X CGAA IUCAGAGA		TCTCTGAC A CGGCCTCC	
3175	CAGAGGGA CUGAUGAG X CGAA ICCGUGUC		GACACGGC C TCCCTCTG	
3176	GCAGAGGG CUGAUGAG X CGAA IGCCGUGU		ACACGGCC T CCCTCTGC	
3178	UAGCAGAG CUGAUGAG X CGAA IAGGCCGU		ACGGCCTC C CTCTGCTA	
3179	GUAGCAGA CUGAUGAG X CGAA IGAGGCCG		CGGCCTCC C TCTGCTAC	
3180	AGUAGCAG CUGAUGAG X CGAA IGGAGGCC		GGCCTCCC T CTGCTACT	
3182	GGAGUAGC CUGAUGAG X CGAA IAGGGAGG		CCTCCCTC T GCTACTCC	
3185	GAUGGAGU CUGAUGAG X CGAA ICAGAGGG		CCCTCTGC T ACTCCATC	
3188	CAGGAUGG CUGAUGAG X CGAA IUAGCAGA		TCTGCTAC T CCATCCTG	
3190	UUCAGGAU CUGAUGAG X CGAA IAGUAGCA		TGCTACTC C ATCCTGAA	
3191	UUUCAGGA CUGAUGAG X CGAA IGAGUAGC		GCTACTCC A TCCTGAAA	
3194	GGCUUUCA CUGAUGAG X CGAA IAUGGAGU		ACTCCATC C TGAAAGCC	
3195	UGGCUUUC CUGAUGAG X CGAA IGAUGGAG		CTCCATCC T GAAAGCCA	
3202	GCGUUCUU CUGAUGAG X CGAA ICUUUCAG		CTGAAAGC C AAGAACGC	
3203	UGCGUUCU CUGAUGAG X CGAA IGCUUUCA		TGAAAGCC A AGAACGCA	
3211	GACAUCCC CUGAUGAG X CGAA ICGUUCUU		AAGAACGC A GGGATGTC	
3222	UGGCCCCC CUGAUGAG X CGAA ICGACAUC		GATGTCGC T GGGGGCCA	
3229	GCGCCCUU CUGAUGAG X CGAA ICCCCCAG		CTGGGGGC C AAGGGCGC	
3230	GGCGCCCU CUGAUGAG X CGAA IGCCCCCA		TGGGGGCC A AGGGCGCC	
3238	GGGCCGGC CUGAUGAG X CGAA ICGCCCUU		AAGGGCGC C GCCGGCCC	
3241	AGAGGGCC CUGAUGAG X CGAA ICGGCGCC		GGCGCCGC C GGCCCTCT	
3245	GGGCAGAG CUGAUGAG X CGAA ICCGGCGG		CCGCCGGC C CTCTGCCC	
3246	AGGGCAGA CUGAUGAG X CGAA IGCCGGCG		CGCCGGCC C TCTGCCCT	
3247	GAGGGCAG CUGAUGAG X CGAA IGGCCGGC		GCCGGCCC T CTGCCCTC	

Table 14

3249	CGGAGGGC CUGAUGAG X CGAA IAGGGCCG		CGGCCCTC T GCCCTCCG	
3252	CCUCGGAG CUGAUGAG X CGAA ICAGAGGG		CCCTCTGC C CTCCGAGG	
3253	GCCUCGGA CUGAUGAG X CGAA IGCAGAGG		CCTCTGCC C TCCGAGGC	
3254	GGCCUCGG CUGAUGAG X CGAA IGGCAGAG		CTCTGCCC T CCGAGGCC	
3256	ACGGCCUC CUGAUGAG X CGAA IAGGGCAG		CTGCCCTC C GAGGCCGT	
3262	CACUGCAC CUGAUGAG X CGAA ICCUCGGA		TCCGAGGC C GTGCAGTG	
3267	ACAGCCAC CUGAUGAG X CGAA ICACGGCC		GGCCGTGC A GTGGCTGT	
3273	GGUGGCAC CUGAUGAG X CGAA ICCACUGC		GCAGTGGC T GTGCCACC	
3278	UGCUUGGU CUGAUGAG X CGAA ICACAGCC		GGCTGTGC C ACCAAGCA	
3279	AUGCUUGG CUGAUGAG X CGAA IGCACAGC		GCTGTGCC A CCAAGCAT	
3281	GAAUGCUU CUGAUGAG X CGAA IUGGCACA		TGTGCCAC C AAGCATTC	
3282	GGAAUGCU CUGAUGAG X CGAA IGUGGCAC		GTGCCACC A AGCATTCC	
3286	AGCAGGAA CUGAUGAG X CGAA ICUUGGUG		CACCAAGC A TTCCTGCT	
3290	CUUGAGCA CUGAUGAG X CGAA IAAUGCUU		AAGCATTC C TGCTCAAG	
3291	GCUUGAGC CUGAUGAG X CGAA IGAAUGCU		AGCATTCC T GCTCAAGC	
3294	UCAGCUUG CUGAUGAG X CGAA ICAGGAAU		ATTCCTGC T CAAGCTGA	
3296	AGUCAGCU CUGAUGAG X CGAA IAGCAGGA		TCCTGCTC A AGCTGACT	
3300	GUCGAGUC CUGAUGAG X CGAA ICUUGAGC		GCTCAAGC T GACTCGAC	
3304	CGGUGUCG CUGAUGAG X CGAA IUCAGCUU		AAGCTGAC T CGACACCG	
3309	UGACACGG CUGAUGAG X CGAA IUCGAGUC		GACTCGAC A CCGTGTCA	
3311	GGUGACAC CUGAUGAG X CGAA IUGUCGAG		CTCGACAC C GTGTCACC	
3317	CACGUAGG CUGAUGAG X CGAA IACACGGU		ACCGTGTC A CCTACGTG	
3319	GGCACGUA CUGAUGAG X CGAA IUGACACG		CGTGTCAC C TACGTGCC	
3320	UGGCACGU CUGAUGAG X CGAA IGUGACAC		GTGTCACC T ACGTGCCA	
3327	CCAGGAGU CUGAUGAG X CGAA ICACGUAG		CTACGTGC C ACTCCTGG	
3328	CCCAGGAG CUGAUGAG X CGAA IGCACGUA		TACGTGCC A CTCCTGGG	
3330	ACCCCAGG CUGAUGAG X CGAA IUGGCACG		CGTGCCAC T CCTGGGGT	
3332	UGACCCCA CUGAUGAG X CGAA IAGUGGCA		TGCCACTC C TGGGGTCA	
3333	GUGACCCC CUGAUGAG X CGAA IGAGUGGC		GCCACTCC T GGGGTCAC	
3340	GUCCUGAG CUGAUGAG X CGAA IACCCCAG		CTGGGGTC A CTCAGGAC	
3342	CUGUCCUG CUGAUGAG X CGAA IUGACCCC		GGGGTCAC T CAGGACAG	
3344	GGCUGUCC CUGAUGAG X CGAA IAGUGACC		GGTCACTC A GGACAGCC	
3349	GUCUGGGC CUGAUGAG X CGAA IUCCUGAG		CTCAGGAC A GCCCAGAC	
3352	UGCGUCUG CUGAUGAG X CGAA ICUGUCCU		AGGACAGC C CAGACGCA	
3353	CUGCGUCU CUGAUGAG X CGAA IGCUGUCC		GGACAGCC C AGACGCAG	
3354	GCUGCGUC CUGAUGAG X CGAA IGGCUGUC		GACAGCCC A GACGCAGC	
3360	GACUCAGC CUGAUGAG X CGAA ICGUCUGG		CCAGACGC A GCTGAGTC	
3363	UCCGACUC CUGAUGAG X CGAA ICUGCGUC		GACGCAGC T GAGTCGGA	
3375	UCCCCGGG CUGAUGAG X CGAA ICUUCCGA		TCGGAAGC T CCCGGGGA	
3377	CGUCCCCG CUGAUGAG X CGAA IAGCUUCC		GGAAGCTC C CGGGGACG	
3378	UCGUCCCC CUGAUGAG X CGAA IGAGCUUC		GAAGCTCC C GGGGACGA	
3390	GGGCAGUC CUGAUGAG X CGAA ICGUCGUC		GACGACGC T GACTGCCC	
3394	UCCAGGGC CUGAUGAG X CGAA IUCAGCGU		ACGCTGAC T GCCCTGGA	
3397	GCCUCCAG CUGAUGAG X CGAA ICAGUCAG		CTGACTGC C CTGGAGGC	
3398	GGCCUCCA CUGAUGAG X CGAA IGCAGUCA		TGACTGCC C TGGAGGCC	
3399	CGGCCUCC CUGAUGAG X CGAA IGGCAGUC		GACTGCCC T GGAGGCCG	
3406	UUGGCUGC CUGAUGAG X CGAA ICCUCCAG		CTGGAGGC C GCAGCCAA	

Table 14

3409	GGGUUGGC CUGAUGAG X CGAA ICGGCCUC		GAGGCCGC A GCCAACCC	
3412	GCCGGGUU CUGAUGAG X CGAA ICUGCGGC		GCCGCAGC C AACCCGGC	
3413	UGCCGGGU CUGAUGAG X CGAA IGCUGCGG		CCGCAGCC A ACCCGGCA	
3416	CAGUGCCG CUGAUGAG X CGAA IUUGGCUG		CAGCCAAC C CGGCACTG	
3417	GCAGUGCC CUGAUGAG X CGAA IGUUGGCU		AGCCAACC C GGCACTGC	
3421	GAGGGCAG CUGAUGAG X CGAA ICCGGGUU		AACCCGGC A CTGCCCTC	
3423	CUGAGGGC CUGAUGAG X CGAA IUGCCGGG		CCCGGCAC T GCCCTCAG	
3426	AGUCUGAG CUGAUGAG X CGAA ICAGUGCC		GGCACTGC C CTCAGACT	
3427	AAGUCUGA CUGAUGAG X CGAA IGCAGUGC		GCACTGCC C TCAGACTT	
3428	GAAGUCUG CUGAUGAG X CGAA IGGCAGUG		CACTGCCC T CAGACTTC	
3430	UUGAAGUC CUGAUGAG X CGAA IAGGGCAG		CTGCCCTC A GACTTCAA	
3434	GGUCUUGA CUGAUGAG X CGAA IUCUGAGG		CCTCAGAC T TCAAGACC	
3437	GAUGGUCU CUGAUGAG X CGAA IAAGUCUG		CAGACTTC A AGACCATC	
3442	UCCAGGAU CUGAUGAG X CGAA IUCUUGAA		TTCAAGAC C ATCCTGGA	
3443	GUCCAGGA CUGAUGAG X CGAA IGUCUUGA		TCAAGACC A TCCTGGAC	
3446	UCAGUCCA CUGAUGAG X CGAA IAUGGUCU		AGACCATC C TGGACTGA	
3447	AUCAGUCC CUGAUGAG X CGAA IGAUGGUC		GACCATCC T GGACTGAT	
3452	UGGCCAUC CUGAUGAG X CGAA IUCCAGGA		TCCTGGAC T GATGGCCA	
3459	GGGCGGGU CUGAUGAG X CGAA ICCAUCAG		CTGATGGC C ACCCGCCC	
3460	UGGGCGGG CUGAUGAG X CGAA IGCCAUCA		TGATGGCC A CCCGCCCA	
3462	UGUGGGCG CUGAUGAG X CGAA IUGGCCAU		ATGGCCAC C CGCCCACA	
3463	CUGUGGGC CUGAUGAG X CGAA IGUGGCCA		TGGCCACC C GCCCACAG	
3466	UGGCUGUG CUGAUGAG X CGAA ICGGGUGG		CCACCCGC C CACAGCCA	
3467	CUGGCUGU CUGAUGAG X CGAA IGCGGGUG		CACCCGCC C ACAGCCAG	
3468	CCUGGCUG CUGAUGAG X CGAA IGGCGGGU		ACCCGCCC A CAGCCAGG	
3470	GGCCUGGC CUGAUGAG X CGAA IUGGGCGG		CCGCCCAC A GCCAGGCC	
3473	CUCGGCCU CUGAUGAG X CGAA ICUGUGGG		CCCACAGC C AGGCCGAG	
3474	UCUCGGCC CUGAUGAG X CGAA IGCUGUGG		CCACAGCC A GGCCGAGA	
3478	CUGCUCUC CUGAUGAG X CGAA ICCUGGCU		AGCCAGGC C GAGAGCAG	
3485	CUGGUGUC CUGAUGAG X CGAA ICUCUCGG		CCGAGAGC A GACACCAG	
3489	GCUGCUGG CUGAUGAG X CGAA IUCUGCUC		GAGCAGAC A CCAGCAGC	
3491	GGGCUGCU CUGAUGAG X CGAA IUGUCUGC		GCAGACAC C AGCAGCCC	
3492	AGGGCUGC CUGAUGAG X CGAA IGUGUCUG		CAGACACC A GCAGCCCT	
3495	GACAGGGC CUGAUGAG X CGAA ICUGGUGU		ACACCAGC A GCCCTGTC	
3498	CGUGACAG CUGAUGAG X CGAA ICUGCUGG		CCAGCAGC C CTGTCACG	
3499	GCGUGACA CUGAUGAG X CGAA IGCUGCUG		CAGCAGCC C TGTCACGC	
3500	GGCGUGAC CUGAUGAG X CGAA IGGCUGCU		AGCAGCCC T GTCACGCC	
3504	GCCCGGCG CUGAUGAG X CGAA IACAGGGC		GCCCTGTC A CGCCGGGC	
3508	UAGAGCCC CUGAUGAG X CGAA ICGUGACA		TGTCACGC C GGGCTCTA	
3513	GGACGUAG CUGAUGAG X CGAA ICCCGGCG		CGCCGGGC T CTACGTCC	
3515	UGGGACGU CUGAUGAG X CGAA IAGCCCGG		CCGGGCTC T ACGTCCCA	
3521	CCUCCCUG CUGAUGAG X CGAA IACGUAGA		TCTACGTC C CAGGGAGG	
3522	CCCUCCCU CUGAUGAG X CGAA IGACGUAG		CTACGTCC C AGGGAGGG	
3523	UCCCUCCC CUGAUGAG X CGAA IGGACGUA		TACGTCCC A GGGAGGGA	
3540	UGGGUGUG CUGAUGAG X CGAA ICCGCCCC		GGGGCGGC C CACACCCA	
3541	CUGGGUGU CUGAUGAG X CGAA IGCCGCCC		GGGCGGCC C ACACCCAG	
3542	CCUGGGUG CUGAUGAG X CGAA IGGCCGCC		GGCGGCCC A CACCCAGG	

Table 14

3544	GGCCUGGG CUGAUGAG X CGAA IUGGGCCG		CGGCCCAC A CCCAGGCC	
3546	CGGGCCUG CUGAUGAG X CGAA IUGUGGGC		GCCCACAC C CAGGCCCG	
3547	GCGGGCCU CUGAUGAG X CGAA IGUGUGGG		CCCACACC C AGGCCCGC	
3548	UGCGGGCC CUGAUGAG X CGAA IGGUGUGG		CCACACCC A GGCCCGCA	
3552	GCGGUGCG CUGAUGAG X CGAA ICCUGGGU		ACCCAGGC C CGCACCGC	
3553	AGCGGUGC CUGAUGAG X CGAA IGCCUGGG		CCCAGGCC C GCACCGCT	
3556	CCCAGCGG CUGAUGAG X CGAA ICGGGCCU		AGGCCCGC A CCGCTGGG	
3558	CUCCCAGC CUGAUGAG X CGAA IUGCGGGC		GCCCGCAC C GCTGGGAG	
3561	AGACUCCC CUGAUGAG X CGAA ICGGUGCG		CGCACCGC T GGGAGTCT	
3569	CAGGCCUC CUGAUGAG X CGAA IACUCCCA		TGGGAGTC T GAGGCCTG	
3575	CUCACUCA CUGAUGAG X CGAA ICCUCAGA		TCTGAGGC C TGAGTGAG	
3576	ACUCACUC CUGAUGAG X CGAA IGCCUCAG		CTGAGGCC T GAGTGAGT	
3592	CAGGCCUC CUGAUGAG X CGAA ICCAAACA		TGTTTGGC C GAGGCCTG	
3598	GACAUGCA CUGAUGAG X CGAA ICCUCGGC		GCCGAGGC C TGCATGTC	
3599	GGACAUGC CUGAUGAG X CGAA IGCCUCGG		CCGAGGCC T GCATGTCC	
3602	GCCGGACA CUGAUGAG X CGAA ICAGGCCU		AGGCCTGC A TGTCCGGC	
3607	CUUCAGCC CUGAUGAG X CGAA IACAUGCA		TGCATGTC C GGCTGAAG	
3611	CAGCCUUC CUGAUGAG X CGAA ICCGGACA		TGTCCGGC T GAAGGCTG	
3618	GGACACUC CUGAUGAG X CGAA ICCUUCAG		CTGAAGGC T GAGTGTCC	
3626	CCUCAGCC CUGAUGAG X CGAA IACACUCA		TGAGTGTC C GGCTGAGG	
3630	CAGGCCUC CUGAUGAG X CGAA ICCGGACA		TGTCCGGC T GAGGCCTG	
3636	CUCGCUCA CUGAUGAG X CGAA ICCUCAGC		GCTGAGGC C TGAGCGAG	
3637	ACUCGCUC CUGAUGAG X CGAA IGCCUCAG		CTGAGGCC T GAGCGAGT	
3649	CCUUGGCU CUGAUGAG X CGAA IACACUCG		CGAGTGTC C AGCCAAGG	
3650	CCCUUGGC CUGAUGAG X CGAA IGACACUC		GAGTGTCC A GCCAAGGG	
3653	CAGCCCUU CUGAUGAG X CGAA ICUGGACA		TGTCCAGC C AAGGGCTG	
3654	UCAGCCCU CUGAUGAG X CGAA IGCUGGAC		GTCCAGCC A AGGGCTGA	
3660	GGACACUC CUGAUGAG X CGAA ICCCUUGG		CCAAGGGC T GAGTGTCC	
3668	GGUGUGCU CUGAUGAG X CGAA IACACUCA		TGAGTGTC C AGCACACC	
3669	AGGUGUGC CUGAUGAG X CGAA IGACACUC		GAGTGTCC A GCACACCT	
3672	GGCAGGUG CUGAUGAG X CGAA ICUGGACA		TGTCCAGC A CACCTGCC	
3674	ACGGCAGG CUGAUGAG X CGAA IUGCUGGA		TCCAGCAC A CCTGCCGT	
3676	AGACGGCA CUGAUGAG X CGAA IUGUGCUG		CAGCACAC C TGCCGTCT	
3677	AAGACGGC CUGAUGAG X CGAA IGUGUGCU		AGCACACC T GCCGTCTT	
3680	GUGAAGAC CUGAUGAG X CGAA ICAGGUGU		ACACCTGC C GTCTTCAC	
3684	GGAAGUGA CUGAUGAG X CGAA IACGGCAG		CTGCCGTC T TCACTTCC	
3687	UGGGGAAG CUGAUGAG X CGAA IAAGACGG		CCGTCTTC A CTTCCCCA	
3689	UGUGGGGA CUGAUGAG X CGAA IUGAAGAC		GTCTTCAC T TCCCCACA	
3692	GCCUGUGG CUGAUGAG X CGAA IAAGUGAA		TTCACTTC C CCACAGGC	
3693	AGCCUGUG CUGAUGAG X CGAA IGAAGUGA		TCACTTCC C CACAGGCT	
3694	CAGCCUGU CUGAUGAG X CGAA IGGAAGUG		CACTTCCC C ACAGGCTG	
3695	CCAGCCUG CUGAUGAG X CGAA IGGGAAGU		ACTTCCCC A CAGGCTGG	
3697	CGCCAGCC CUGAUGAG X CGAA IUGGGGAA		TTCCCCAC A GGCTGGCG	
3701	CGAGCGCC CUGAUGAG X CGAA ICCUGUGG		CCACAGGC T GGCGCTCG	
3707	UGGAGCCG CUGAUGAG X CGAA ICGCCAGC		GCTGGCGC T CGGCTCCA	
3712	UGGGGUGG CUGAUGAG X CGAA ICCGAGCG		CGCTCGGC T CCACCCCA	
3714	CCUGGGGU CUGAUGAG X CGAA IAGCCGAG		CTCGGCTC C ACCCCAGG	

Table 14

3715	CCCUGGGG CUGAUGAG X CGAA IGAGCCGA		TCGGCTCC A CCCCAGGG	
3717	GGCCCUGG CUGAUGAG X CGAA IUGGAGCC		GGCTCCAC C CCAGGGCC	
3718	UGGCCCUG CUGAUGAG X CGAA IGUGGAGC		GCTCCACC C CAGGGCCA	
3719	CUGGCCCU CUGAUGAG X CGAA IGGUGGAG		CTCCACCC C AGGGCCAG	
3720	GCUGGCCC CUGAUGAG X CGAA IGGGUGGA		TCCACCCC A GGGCCAGC	
3725	GAAAAGCU CUGAUGAG X CGAA ICCCUGGG		CCCAGGGC C AGCTTTTC	
3726	GGAAAAGC CUGAUGAG X CGAA IGCCCUGG		CCAGGGCC A GCTTTTCC	
3729	UGAGGAAA CUGAUGAG X CGAA ICUGGCCC		GGGCCAGC T TTTCCTCA	
3734	CCUGGUGA CUGAUGAG X CGAA IAAAAGCU		AGCTTTTC C TCACCAGG	
3735	UCCUGGUG CUGAUGAG X CGAA IGAAAAGC		GCTTTTCC T CACCAGGA	
3737	GCUCCUGG CUGAUGAG X CGAA IAGGAAAA		TTTTCCTC A CCAGGAGC	
3739	GGGCUCCU CUGAUGAG X CGAA IUGAGGAA		TTCCTCAC C AGGAGCCC	
3740	CGGGCUCC CUGAUGAG X CGAA IGUGAGGA		TCCTCACC A GGAGCCCG	
3746	GGAAGCCG CUGAUGAG X CGAA ICUCCUGG		CCAGGAGC C CGGCTTCC	
3747	UGGAAGCC CUGAUGAG X CGAA IGCUCCUG		CAGGAGCC C GGCTTCCA	
3751	GGAGUGGA CUGAUGAG X CGAA ICCGGGCU		AGCCCGGC T TCCACTCC	
3754	UGGGGAGU CUGAUGAG X CGAA IAAGCCGG		CCGGCTTC C ACTCCCCA	
3755	GUGGGGAG CUGAUGAG X CGAA IGAAGCCG		CGGCTTCC A CTCCCCAC	
3757	AUGUGGGG CUGAUGAG X CGAA IUGGAAGC		GCTTCCAC T CCCCACAT	
3759	CUAUGUGG CUGAUGAG X CGAA IAGUGGAA		TTCCACTC C CCACATAG	
3760	CCUAUGUG CUGAUGAG X CGAA IGAGUGGA		TCCACTCC C CACATAGG	
3761	UCCUAUGU CUGAUGAG X CGAA IGGAGUGG		CCACTCCC C ACATAGGA	
3762	UUCCUAUG CUGAUGAG X CGAA IGGGAGUG		CACTCCCC A CATAGGAA	
3764	UAUUCCUA CUGAUGAG X CGAA IUGGGGAG		CTCCCCAC A TAGGAATA	
3776	CUGGGGAU CUGAUGAG X CGAA IACUAUUC		GAATAGTC C ATCCCCAG	
3777	UCUGGGGA CUGAUGAG X CGAA IGACUAUU		AATAGTCC A TCCCCAGA	
3780	GAAUCUGG CUGAUGAG X CGAA IAUGGACU		AGTCCATC C CCAGATTC	
3781	CGAAUCUG CUGAUGAG X CGAA IGAUGGAC		GTCCATCC C CAGATTCG	
3782	GCGAAUCU CUGAUGAG X CGAA IGGAUGGA		TCCATCCC C AGATTCGC	
3783	GGCGAAUC CUGAUGAG X CGAA IGGGAUGG		CCATCCCC A GATTCGCC	
3791	UGAACAAU CUGAUGAG X CGAA ICGAAUCU		AGATTCGC C ATTGTTCA	
3792	GUGAACAA CUGAUGAG X CGAA IGCGAAUC		GATTCGCC A TTGTTCAC	
3799	GCGAGGGG CUGAUGAG X CGAA IAACAAUG		CATTGTTC A CCCCTCGC	
3801	GGGCGAGG CUGAUGAG X CGAA IUGAACAA		TTGTTCAC C CCTCGCCC	
3802	AGGGCGAG CUGAUGAG X CGAA IGUGAACA		TGTTCACC C CTCGCCCT	
3803	CAGGGCGA CUGAUGAG X CGAA IGGUGAAC		GTTCACCC C TCGCCCTG	
3804	GCAGGGCG CUGAUGAG X CGAA IGGGUGAA		TTCACCCC T CGCCCTGC	
3808	GAGGGCAG CUGAUGAG X CGAA ICGAGGGG		CCCCTCGC C CTGCCCTC	
3809	GGAGGGCA CUGAUGAG X CGAA IGCGAGGG		CCCTCGCC C TGCCCTCC	
3810	AGGAGGGC CUGAUGAG X CGAA IGGCGAGG		CCTCGCCC T GCCCTCCT	
3813	CAAAGGAG CUGAUGAG X CGAA ICAGGGCG		CGCCCTGC C CTCCTTTG	
3814	GCAAAGGA CUGAUGAG X CGAA IGCAGGGC		GCCCTGCC C TCCTTTGC	
3815	GGCAAAGG CUGAUGAG X CGAA IGGCAGGG		CCCTGCCC T CCTTTGCC	
3817	AAGGCAAA CUGAUGAG X CGAA IAGGGCAG		CTGCCCTC C TTTGCCTT	
3818	GAAGGCAA CUGAUGAG X CGAA IGAGGGCA		TGCCCTCC T TTGCCTTC	
3823	GGGUGGAA CUGAUGAG X CGAA ICAAAGGA		TCCTTTGC C TTCCACCC	
3824	GGGGUGGA CUGAUGAG X CGAA IGCAAAGG		CCTTTGCC T TCCACCCC	

Table 14

3827	GUGGGGGU CUGAUGAG X CGAA IAAGGCAA		TTGCCTTC C ACCCCCAC	
3828	GGUGGGGG CUGAUGAG X CGAA IGAAGGCA		TGCCTTCC A CCCCCACC	
3830	AUGGUGGG CUGAUGAG X CGAA IUGGAAGG		CCTTCCAC C CCCACCAT	
3831	GAUGGUGG CUGAUGAG X CGAA IGUGGAAG		CTTCCACC C CCACCATC	
3832	GGAUGGUG CUGAUGAG X CGAA IGGUGGAA		TTCCACCC C CACCATCC	
3833	UGGAUGGU CUGAUGAG X CGAA IGGGUGGA		TCCACCCC C ACCATCCA	
3834	CUGGAUGG CUGAUGAG X CGAA IGGGGUGG		CCACCCCC A CCATCCAG	
3836	ACCUGGAU CUGAUGAG X CGAA IUGGGGGU		ACCCCCAC C ATCCAGGT	
3837	CACCUGGA CUGAUGAG X CGAA IGUGGGGG		CCCCCACC A TCCAGGTG	
3840	CUCCACCU CUGAUGAG X CGAA IAUGGUGG		CCACCATC C AGGTGGAG	
3841	UCUCCACC CUGAUGAG X CGAA IGAUGGUG		CACCATCC A GGTGGAGA	
3851	CUUCUCAG CUGAUGAG X CGAA IUCUCCAC		GTGGAGAC C CTGAGAAG	
3852	CCUUCUCA CUGAUGAG X CGAA IGUCUCCA		TGGAGACC C TGAGAAGG	
3853	UCCUUCUC CUGAUGAG X CGAA IGGUCUCC		GGAGACCC T GAGAAGGA	
3863	GCUCCCAG CUGAUGAG X CGAA IUCCUUCU		AGAAGGAC C CTGGGAGC	
3864	AGCUCCCA CUGAUGAG X CGAA IGUCCUUC		GAAGGACC C TGGGAGCT	
3865	GAGCUCCC CUGAUGAG X CGAA IGGUCCUU		AAGGACCC T GGGAGCTC	
3872	AUUCCCAG CUGAUGAG X CGAA ICUCCCAG		CTGGGAGC T CTGGGAAT	
3874	AAAUUCCC CUGAUGAG X CGAA IAGCUCCC		GGGAGCTC T GGGAATTT	
3891	ACACCUUU CUGAUGAG X CGAA IUCACUCC		GGAGTGAC C AAAGGTGT	
3892	CACACCUU CUGAUGAG X CGAA IGUCACUC		GAGTGACC A AAGGTGTG	
3902	GUGUACAG CUGAUGAG X CGAA ICACACCU		AGGTGTGC C CTGTACAC	
3903	UGUGUACA CUGAUGAG X CGAA IGCACACC		GGTGTGCC C TGTACACA	
3904	CUGUGUAC CUGAUGAG X CGAA IGGCACAC		GTGTGCCC T GTACACAG	
3909	CUCGCCUG CUGAUGAG X CGAA IUACAGGG		CCCTGTAC A CAGGCGAG	
3911	UCCUCGCC CUGAUGAG X CGAA IUGUACAG		CTGTACAC A GGCGAGGA	
3921	AGGUGCAG CUGAUGAG X CGAA IUCCUCGC		GCGAGGAC C CTGCACCT	
3922	CAGGUGCA CUGAUGAG X CGAA IGUCCUCG		CGAGGACC C TGCACCTG	
3923	CCAGGUGC CUGAUGAG X CGAA IGGUCCUC		GAGGACCC T GCACCTGG	
3926	CAUCCAGG CUGAUGAG X CGAA ICAGGGUC		GACCCTGC A CCTGGATG	
3928	CCCAUCCA CUGAUGAG X CGAA IUGCAGGG		CCCTGCAC C TGGATGGG	
3929	CCCCAUCC CUGAUGAG X CGAA IGUGCAGG		CCTGCACC T GGATGGGG	
3941	ACCCACAG CUGAUGAG X CGAA IACCCCCA		TGGGGGTC C CTGTGGGT	
3942	GACCCACA CUGAUGAG X CGAA IGACCCCC		GGGGGTCC C TGTGGGTC	
3943	UGACCCAC CUGAUGAG X CGAA IGGACCCC		GGGGTCCC T GTGGGTCA	
3951	CCCCAAUU CUGAUGAG X CGAA IACCCACA		TGTGGGTC A AATTGGGG	
3968	ACUCCCAC CUGAUGAG X CGAA ICACCUCC		GGAGGTGC T GTGGGAGT	
3984	AUAUAUUC CUGAUGAG X CGAA IUAUUUUA		TAAAATAC T GAATATAT	
4002	UUCAAAAC CUGAUGAG X CGAA IAAAAACU		AGTTTTTC A GTTTTGAA	

Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II sequence and length (greater than or equal to 2 base-pairs)). I = Inosine nucleotide

Seq1 = TERT (Homo sapiens telomerase reverse transcriptase (TERT) mRNA, 4015 bp); Nakamura *et al.*, Science 277 (5328), 955-959 (1997)

Table 15

Table 15: Human telomerase reverse transcriptase (TERT) G-Cleaver Ribozyme and Target Sequence

nt. Position	Substrate Sequence	Seq ID Nos	Ribozyme Sequence	Seq ID Nos
16	GCUGCGUCCU G CUGCG		CGCAG UGAUGGCAUGCACUAUGCGCG AGGACGCAGC	
19	GCGUCCUGCU G CGCAC		GUGCG UGAUGGCAUGCACUAUGCGCG AGCAGGACGC	
21	GUCCUGCUGC G CACGU		ACGUG UGAUGGCAUGCACUAUGCGCG GCAGCAGGAC	
53	GGCCACCCCC G CGAUG		CAUCG UGAUGGCAUGCACUAUGCGCG GGGGGUGGCC	
55	CCACCCCCGC G AUGCC		GGCAU UGAUGGCAUGCACUAUGCGCG GCGGGGGUGG	
58	CCCCCGCGAU G CCGCG		CGCGG UGAUGGCAUGCACUAUGCGCG AUCGCGGGGG	
61	CCGCGAUGCC G CGCGC		GCGCG UGAUGGCAUGCACUAUGCGCG GGCAUCGCGG	
63	GCGAUGCCGC G CGCUC		GAGCG UGAUGGCAUGCACUAUGCGCG GCGGCAUCGC	
65	GAUGCCGCGC G CUCCC		GGGAG UGAUGGCAUGCACUAUGCGCG GCGCGGCAUC	
72	CGCGCUCCCC G CUGCC		GGCAG UGAUGGCAUGCACUAUGCGCG GGGGAGCGCG	
75	GCUCCCCGCU G CCGAG		CUCGG UGAUGGCAUGCACUAUGCGCG AGCGGGGAGC	
78	CCCCGCUGCC G AGCCG		CGGCU UGAUGGCAUGCACUAUGCGCG GGCAGCGGGG	
85	GCCGAGCCGU G CGCUC		GAGCG UGAUGGCAUGCACUAUGCGCG ACGGCUCGGC	
87	CGAGCCGUGC G CUCCC		GGGAG UGAUGGCAUGCACUAUGCGCG GCACGGCUCG	
94	UGCGCUCCCU G CUGCG		CGCAG UGAUGGCAUGCACUAUGCGCG AGGGAGCGCA	
97	GCUCCCUGCU G CGCAG		CUGCG UGAUGGCAUGCACUAUGCGCG AGCAGGGAGC	
99	UCCCUGCUGC G CAGCC		GGCUG UGAUGGCAUGCACUAUGCGCG GCAGCAGGGA	
111	AGCCACUACC G CGAGG		CCUCG UGAUGGCAUGCACUAUGCGCG GGUAGUGGCU	
113	CCACUACCGC G AGGUG		CACCU UGAUGGCAUGCACUAUGCGCG GCGGUAGUGG	
118	ACCGCGAGGU G CUGCC		GGCAG UGAUGGCAUGCACUAUGCGCG ACCUCGCGGU	
121	GCGAGGUGCU G CCGCU		AGCGG UGAUGGCAUGCACUAUGCGCG AGCACCUCGC	
124	AGGUGCUGCC G CUGGC		GCCAG UGAUGGCAUGCACUAUGCGCG GGCAGCACCU	
139	CCACGUUCGU G CGGCG		CGCCG UGAUGGCAUGCACUAUGCGCG ACGAACGUGG	
144	UUCGUGCGGC G CCUGG		CCAGG UGAUGGCAUGCACUAUGCGCG GCCGCACGAA	
172	GGCGGCUGGU G CAGCG		CGCUG UGAUGGCAUGCACUAUGCGCG ACCAGCCGCC	
177	CUGGUGCAGC G CGGGG		CCCCG UGAUGGCAUGCACUAUGCGCG GCUGCACCAG	
198	GCGGCUUUCC G CGCGC		GCGCG UGAUGGCAUGCACUAUGCGCG GGAAAGCCGC	
200	GGCUUUCCGC G CGCUG		CAGCG UGAUGGCAUGCACUAUGCGCG GCGGAAAGCC	

Table 15

202	CUUUCCGCGC G CUGGU		ACCAG UGAUGGCAUGCACUAUGCGCG GCGCGGAAAG	
216	GUGGCCCAGU G CCUGG		CCAGG UGAUGGCAUGCACUAUGCGCG ACUGGGCCAC	
223	AGUGCCUGGU G UGCGU		ACGCA UGAUGGCAUGCACUAUGCGCG ACCAGGCACU	
225	UGCCUGGUGU G CGUGC		GCACG UGAUGGCAUGCACUAUGCGCG ACACCAGGCA	
229	UGGUGUGCGU G CCCUG		CAGGG UGAUGGCAUGCACUAUGCGCG ACGCACACCA	
239	GCCCUGGGAC G CACGG		CCGUG UGAUGGCAUGCACUAUGCGCG GUCCCAGGGC	
247	ACGCACGGCC G CCCCC		GGGGG UGAUGGCAUGCACUAUGCGCG GGCCGUGCGU	
254	GCCGCCCCCC G CCGCC		GGCGG UGAUGGCAUGCACUAUGCGCG GGGGGGCGGC	
257	GCCCCCCGCC G CCCCC		GGGGG UGAUGGCAUGCACUAUGCGCG GGCGGGGGGC	
270	CCCUCCUUCC G CCAGG		CCUGG UGAUGGCAUGCACUAUGCGCG GGAAGGAGGG	
277	UCCGCCAGGU G UCCUG		CAGGA UGAUGGCAUGCACUAUGCGCG ACCUGGCGGA	
282	CAGGUGUCCU G CCUGA		UCAGG UGAUGGCAUGCACUAUGCGCG AGGACACCUG	
286	UGUCCUGCCU G AAGGA		UCCUU UGAUGGCAUGCACUAUGCGCG AGGCAGGACA	
303	CUGGUGGCCC G AGUGC		GCACU UGAUGGCAUGCACUAUGCGCG GGGCCACCAG	
307	UGGCCCGAGU G CUGCA		UGCAG UGAUGGCAUGCACUAUGCGCG ACUCGGGCCA	
310	CCCGAGUGCU G CAGAG		CUCUG UGAUGGCAUGCACUAUGCGCG AGCACUCGGG	
319	UGCAGAGGCU G UGCGA		UCGCA UGAUGGCAUGCACUAUGCGCG AGCCUCUGCA	
321	CAGAGGCUGU G CGAGC		GCUCG UGAUGGCAUGCACUAUGCGCG ACAGCCUCUG	
323	GAGGCUGUGC G AGCGC		GCGCU UGAUGGCAUGCACUAUGCGCG GCACAGCCUC	
327	CUGUGCGAGC G CGGCG		CGCCG UGAUGGCAUGCACUAUGCGCG GCUCGCACAG	
332	CGAGCGCGGC G CGAAG		CUUCG UGAUGGCAUGCACUAUGCGCG GCCGCGCUCG	
334	AGCGCGGCGC G AAGAA		UUCUU UGAUGGCAUGCACUAUGCGCG GCGCCGCGCU	
343	CGAAGAACGU G CUGGC		GCCAG UGAUGGCAUGCACUAUGCGCG ACGUUCUUCG	
359	CUUCGGCUUC G CGCUG		CAGCG UGAUGGCAUGCACUAUGCGCG GAAGCCGAAG	
361	UCGGCUUCGC G CUGCU		AGCAG UGAUGGCAUGCACUAUGCGCG GCGAAGCCGA	
364	GCUUCGCGCU G CUGGA		UCCAG UGAUGGCAUGCACUAUGCGCG AGCGCGAAGC	
378	GACGGGGCCC G CGGGG		CCCCG UGAUGGCAUGCACUAUGCGCG GGGCCCCGUC	
392	GGGCCCCCCC G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG GGGGGGGCCC	
412	CCACCAGCGU G CGCAG		CUGCG UGAUGGCAUGCACUAUGCGCG ACGCUGGUGG	
414	ACCAGCGUGC G CAGCU		AGCUG UGAUGGCAUGCACUAUGCGCG GCACGCUGGU	
424	GCAGCUACCU G CCCAA		UUGGG UGAUGGCAUGCACUAUGCGCG AGGUAGCUGC	

Table 15

436	CCAACACGGU G ACCGA		UCGGU UGAUGGCAUGCACUAUGCGCG ACCGUGUUGG	
440	CACGGUGACC G ACGCA		UGCGU UGAUGGCAUGCACUAUGCGCG GGUCACCGUG	
443	GGUGACCGAC G CACUG		CAGUG UGAUGGCAUGCACUAUGCGCG GUCGGUCACC	
448	CCGACGCACU G CGGGG		CCCCG UGAUGGCAUGCACUAUGCGCG AGUGCGUCGG	
472	CGUGGGGGCU G CUGCU		AGCAG UGAUGGCAUGCACUAUGCGCG AGCCCCCACG	
475	GGGGGCUGCU G CUGCG		CGCAG UGAUGGCAUGCACUAUGCGCG AGCAGCCCCC	
478	GGCUGCUGCU G CGCCG		CGGCG UGAUGGCAUGCACUAUGCGCG AGCAGCAGCC	
480	CUGCUGCUGC G CCGCG		CGCGG UGAUGGCAUGCACUAUGCGCG GCAGCAGCAG	
483	CUGCUGCGCC G CGUGG		CCACG UGAUGGCAUGCACUAUGCGCG GGCGCAGCAG	
491	CCGCGUGGGC G ACGAC		GUCGU UGAUGGCAUGCACUAUGCGCG GCCCACGCGG	
494	CGUGGGCGAC G ACGUG		CACGU UGAUGGCAUGCACUAUGCGCG GUCGCCCACG	
499	GCGACGACGU G CUGGU		ACCAG UGAUGGCAUGCACUAUGCGCG ACGUCGUCGC	
511	UGGUUCACCU G CUGGC		GCCAG UGAUGGCAUGCACUAUGCGCG AGGUGAACCA	
519	CUGCUGGCAC G CUGCG		CGCAG UGAUGGCAUGCACUAUGCGCG GUGCCAGCAG	
522	CUGGCACGCU G CGCGC		GCGCG UGAUGGCAUGCACUAUGCGCG AGCGUGCCAG	
524	GGCACGCUGC G CGCUC		GAGCG UGAUGGCAUGCACUAUGCGCG GCAGCGUGCC	
526	CACGCUGCGC G CUCUU		AAGAG UGAUGGCAUGCACUAUGCGCG GCGCAGCGUG	
533	CGCGCUCUUU G UGCUG		CAGCA UGAUGGCAUGCACUAUGCGCG AAAGAGCGCG	
535	CGCUCUUUGU G CUGGU		ACCAG UGAUGGCAUGCACUAUGCGCG ACAAAGAGCG	
552	GCUCCCAGCU G CGCCU		AGGCG UGAUGGCAUGCACUAUGCGCG AGCUGGGAGC	
554	UCCCAGCUGC G CCUAC		GUAGG UGAUGGCAUGCACUAUGCGCG GCAGCUGGGA	
565	CCUACCAGGU G UGCGG		CCGCA UGAUGGCAUGCACUAUGCGCG ACCUGGUAGG	
567	UACCAGGUGU G CGGGC		GCCCG UGAUGGCAUGCACUAUGCGCG ACACCUGGUA	
574	UGUGCGGGCC G CCGCU		AGCGG UGAUGGCAUGCACUAUGCGCG GGCCCGCACA	
577	GCGGGCCGCC G CUGUA		UACAG UGAUGGCAUGCACUAUGCGCG GGCGGCCCGC	
580	GGCCGCCGCU G UACCA		UGGUA UGAUGGCAUGCACUAUGCGCG AGCGGCGGCC	
593	CCAGCUCGGC G CUGCC		GGCAG UGAUGGCAUGCACUAUGCGCG GCCGAGCUGG	
596	GCUCGGCGCU G CCACU		AGUGG UGAUGGCAUGCACUAUGCGCG AGCGCCGAGC	
616	CCCGGCCCCC G CCACA		UGUGG UGAUGGCAUGCACUAUGCGCG GGGGGCCGGG	
623	CCCGCCACAC G CUAGU		ACUAG UGAUGGCAUGCACUAUGCGCG GUGUGGCGGG	
636	AGUGGACCCC G AAGGC		GCCUU UGAUGGCAUGCACUAUGCGCG GGGGUCCACU	

Table 15

651	CGUCUGGGAU G CGAAC		GUUCG UGAUGGCAUGCACUAUGCGCG AUCCCAGACG	
653	UCUGGGAUGC G AACGG		CCGUU UGAUGGCAUGCACUAUGCGCG GCAUCCCAGA	
703	CCCUGGGCCU G CCAGC		GCUGG UGAUGGCAUGCACUAUGCGCG AGGCCCAGGG	
716	AGCCCCGGGU G CGAGG		CCUCG UGAUGGCAUGCACUAUGCGCG ACCCGGGGCU	
718	CCCCGGGUGC G AGGAG		CUCCU UGAUGGCAUGCACUAUGCGCG GCACCCGGGG	
726	GCGAGGAGGC G CGGGG		CCCCG UGAUGGCAUGCACUAUGCGCG GCCUCCUCGC	
737	CGGGGGCAGU G CCAGC		GCUGG UGAUGGCAUGCACUAUGCGCG ACUGCCCCCG	
744	AGUGCCAGCC G AAGUC		GACUU UGAUGGCAUGCACUAUGCGCG GGCUGGCACU	
751	GCCGAAGUCU G CCGUU		AACGG UGAUGGCAUGCACUAUGCGCG AGACUUCGGC	
757	GUCUGCCGUU G CCCAA		UUGGG UGAUGGCAUGCACUAUGCGCG AACGGCAGAC	
779	CAGGCGUGGC G CUGCC		GGCAG UGAUGGCAUGCACUAUGCGCG GCCACGCCUG	
782	GCGUGGCGCU G CCCCU		AGGGG UGAUGGCAUGCACUAUGCGCG AGCGCCACGC	
788	CGCUGCCCCU G AGCCG		CGGCU UGAUGGCAUGCACUAUGCGCG AGGGGCAGCG	
802	CGGAGCGGAC G CCCGU		ACGGG UGAUGGCAUGCACUAUGCGCG GUCCGCUCCG	
841	CGGGCAGGAC G CGUGG		CCACG UGAUGGCAUGCACUAUGCGCG GUCCUGCCCG	
850	CGCGUGGACC G AGUGA		UCACU UGAUGGCAUGCACUAUGCGCG GGUCCACGCG	
854	UGGACCGAGU G ACCGU		ACGGU UGAUGGCAUGCACUAUGCGCG ACUCGGUCCA	
867	CGUGGUUUCU G UGUGG		CCACA UGAUGGCAUGCACUAUGCGCG AGAAACCACG	
869	UGGUUUCUGU G UGGUG		CACCA UGAUGGCAUGCACUAUGCGCG ACAGAAACCA	
874	UCUGUGUGGU G UCACC		GGUGA UGAUGGCAUGCACUAUGCGCG ACCACACAGA	
881	GGUGUCACCU G CCAGA		UCUGG UGAUGGCAUGCACUAUGCGCG AGGUGACACC	
890	UGCCAGACCC G CCGAA		UUCGG UGAUGGCAUGCACUAUGCGCG GGGUCUGGCA	
893	CAGACCCGCC G AAGAA		UUCUU UGAUGGCAUGCACUAUGCGCG GGCGGGUCUG	
917	UUUGGAGGGU G CGCUC		GAGCG UGAUGGCAUGCACUAUGCGCG ACCCUCCAAA	
919	UGGAGGGUGC G CUCUC		GAGAG UGAUGGCAUGCACUAUGCGCG GCACCCUCCA	
931	UCUCUGGCAC G CGCCA		UGGCG UGAUGGCAUGCACUAUGCGCG GUGCCAGAGA	
933	UCUGGCACGC G CCACU		AGUGG UGAUGGCAUGCACUAUGCGCG GCGUGCCAGA	
957	UCCGUGGGCC G CCAGC		GCUGG UGAUGGCAUGCACUAUGCGCG GGCCCACGGA	
968	CCAGCACCAC G CGGGC		GCCCG UGAUGGCAUGCACUAUGCGCG GUGGUGCUGG	
988	CAUCCACAUC G CGGCC		GGCCG UGAUGGCAUGCACUAUGCGCG GAUGUGGAUG	
1012	CCUGGGACAC G CCUUG		CAAGG UGAUGGCAUGCACUAUGCGCG GUGUCCCAGG	

Table 15

1017	GACACGCCUU G UCCCC		GGGGA UGAUGGCAUGCACUAUGCGCG AAGGCGUGUC	
1027	GUCCCCCGGU G UACGC		GCGUA UGAUGGCAUGCACUAUGCGCG ACCGGGGGAC	
1031	CCCGGUGUAC G CCGAG		CUCGG UGAUGGCAUGCACUAUGCGCG GUACACCGGG	
1034	GGUGUACGCC G AGACC		GGUCU UGAUGGCAUGCACUAUGCGCG GGCGUACACC	
1064	CUCCUCAGGC G ACAAG		CUUGU UGAUGGCAUGCACUAUGCGCG GCCUGAGGAG	
1078	AGGAGCAGCU G CGGCC		GGCCG UGAUGGCAUGCACUAUGCGCG AGCUGCUCCU	
1105	UCAGCUCUCU G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG AGAGAGCUGA	
1117	GGCCCAGCCU G ACUGG		CCAGU UGAUGGCAUGCACUAUGCGCG AGGCUGGGCC	
1124	CCUGACUGGC G CUCGG		CCGAG UGAUGGCAUGCACUAUGCGCG GCCAGUCAGG	
1171	GGCCCUGGAU G CCAGG		CCUGG UGAUGGCAUGCACUAUGCGCG AUCCAGGGCC	
1185	GGGACUCCCC G CAGGU		ACCUG UGAUGGCAUGCACUAUGCGCG GGGGAGUCCC	
1192	CCCGCAGGUU G CCCCG		CGGGG UGAUGGCAUGCACUAUGCGCG AACCUGCGGG	
1197	AGGUUGCCCC G CCUGC		GCAGG UGAUGGCAUGCACUAUGCGCG GGGGCAACCU	
1201	UGCCCCGCCU G CCCCA		UGGGG UGAUGGCAUGCACUAUGCGCG AGGCGGGGCA	
1209	CUGCCCCAGC G CUACU		AGUAG UGAUGGCAUGCACUAUGCGCG GCUGGGGCAG	
1222	ACUGGCAAAU G CGGCC		GGCCG UGAUGGCAUGCACUAUGCGCG AUUUGCCAGU	
1231	UGCGGCCCCU G UUUCU		AGAAA UGAUGGCAUGCACUAUGCGCG AGGGGCCGCA	
1243	UUCUGGAGCU G CUUGG		CCAAG UGAUGGCAUGCACUAUGCGCG AGCUCCAGAA	
1256	UGGGAACCAC G CGCAG		CUGCG UGAUGGCAUGCACUAUGCGCG GUGGUUCCCA	
1258	GGAACCACGC G CAGUG		CACUG UGAUGGCAUGCACUAUGCGCG GCGUGGUUCC	
1263	CACGCGCAGU G CCCCU		AGGGG UGAUGGCAUGCACUAUGCGCG ACUGCGCGUG	
1276	CCUACGGGGU G CUCCU		AGGAG UGAUGGCAUGCACUAUGCGCG ACCCCGUAGG	
1288	UCCUCAAGAC G CACUG		CAGUG UGAUGGCAUGCACUAUGCGCG GUCUUGAGGA	
1293	AAGACGCACU G CCCGC		GCGGG UGAUGGCAUGCACUAUGCGCG AGUGCGUCUU	
1297	CGCACUGCCC G CUGCG		CGCAG UGAUGGCAUGCACUAUGCGCG GGGCAGUGCG	
1300	ACUGCCCGCU G CGAGC		GCUCG UGAUGGCAUGCACUAUGCGCG AGCGGGCAGU	
1302	UGCCCGCUGC G AGCUG		CAGCU UGAUGGCAUGCACUAUGCGCG GCAGCGGGCA	
1307	GCUGCGAGCU G CGGUC		GACCG UGAUGGCAUGCACUAUGCGCG AGCUCGCAGC	
1328	AGCAGCCGGU G UCUGU		ACAGA UGAUGGCAUGCACUAUGCGCG ACCGGCUGCU	
1332	GCCGGUGUCU G UGCCC		GGGCA UGAUGGCAUGCACUAUGCGCG AGACACCGGC	
1334	CGGUGUCUGU G CCCGG		CCGGG UGAUGGCAUGCACUAUGCGCG ACAGACACCG	

Table 15

1358	CCAGGGCUCU G UGGCG		CGCCA UGAUGGCAUGCACUAUGCGCG AGAGCCCUGG	
1370	GGCGGCCCCC G AGGAG		CUCCU UGAUGGCAUGCACUAUGCGCG GGGGGCCGCC	
1395	GACCCCCGUC G CCUGG		CCAGG UGAUGGCAUGCACUAUGCGCG GACGGGGGUC	
1402	GUCGCCUGGU G CAGCU		AGCUG UGAUGGCAUGCACUAUGCGCG ACCAGGCGAC	
1408	UGGUGCAGCU G CUCCG		CGGAG UGAUGGCAUGCACUAUGCGCG AGCUGCACCA	
1413	CAGCUGCUCC G CCAGC		GCUGG UGAUGGCAUGCACUAUGCGCG GGAGCAGCUG	
1438	CCUGGCAGGU G UACGG		CCGUA UGAUGGCAUGCACUAUGCGCG ACCUGCCAGG	
1450	ACGGCUUCGU G CGGGC		GCCCG UGAUGGCAUGCACUAUGCGCG ACGAAGCCGU	
1458	GUGCGGGCCU G CCUGC		GCAGG UGAUGGCAUGCACUAUGCGCG AGGCCCGCAC	
1462	GGGCCUGCCU G CGCCG		CGGCG UGAUGGCAUGCACUAUGCGCG AGGCAGGCCC	
1464	GCCUGCCUGC G CCGGC		GCCGG UGAUGGCAUGCACUAUGCGCG GCAGGCAGGC	
1474	GCCGGCUGGU G CCCCC		GGGGG UGAUGGCAUGCACUAUGCGCG ACCAGCCGGC	
1505	CAGGCACAAC G AACGC		GCGUU UGAUGGCAUGCACUAUGCGCG GUUGUGCCUG	
1509	CACAACGAAC G CCGCU		AGCGG UGAUGGCAUGCACUAUGCGCG GUUCGUUGUG	
1512	AACGAACGCC G CUUCC		GGAAG UGAUGGCAUGCACUAUGCGCG GGCGUUCGUU	
1556	GGGGAAGCAU G CCAAG		CUUGG UGAUGGCAUGCACUAUGCGCG AUGCUUCCCC	
1567	CCAAGCUCUC G CUGCA		UGCAG UGAUGGCAUGCACUAUGCGCG GAGAGCUUGG	
1570	AGCUCUCGCU G CAGGA		UCCUG UGAUGGCAUGCACUAUGCGCG AGCGAGAGCU	
1579	UGCAGGAGCU G ACGUG		CACGU UGAUGGCAUGCACUAUGCGCG AGCUCCUGCA	
1591	CGUGGAAGAU G AGCGU		ACGCU UGAUGGCAUGCACUAUGCGCG AUCUUCCACG	
1597	AGAUGAGCGU G CGGGA		UCCCG UGAUGGCAUGCACUAUGCGCG ACGCUCAUCU	
1605	GUGCGGGACU G CGCUU		AAGCG UGAUGGCAUGCACUAUGCGCG AGUCCCGCAC	
1607	GCGGGACUGC G CUUGG		CCAAG UGAUGGCAUGCACUAUGCGCG GCAGUCCCGC	
1615	GCGCUUGGCU G CGCAG		CUGCG UGAUGGCAUGCACUAUGCGCG AGCCAAGCGC	
1617	GCUUGGCUGC G CAGGA		UCCUG UGAUGGCAUGCACUAUGCGCG GCAGCCAAGC	
1638	GGGGUUGGCU G UGUUC		GAACA UGAUGGCAUGCACUAUGCGCG AGCCAACCCC	
1640	GGUUGGCUGU G UUCCG		CGGAA UGAUGGCAUGCACUAUGCGCG ACAGCCAACC	
1649	UGUUCCGGCC G CAGAG		CUCUG UGAUGGCAUGCACUAUGCGCG GGCCGGAACA	
1663	AGCACCGUCU G CGUGA		UCACG UGAUGGCAUGCACUAUGCGCG AGACGGUGCU	
1667	CCGUCUGCGU G AGGAG		CUCCU UGAUGGCAUGCACUAUGCGCG ACGCAGACGG	
1690	CCAAGUUCCU G CACUG		CAGUG UGAUGGCAUGCACUAUGCGCG AGGAACUUGG	

Table 15

1699	UGCACUGGCU G AUGAG		CUCAU UGAUGGCAUGCACUAUGCGCG AGCCAGUGCA	
1702	ACUGGCUGAU G AGUGU		ACACU UGAUGGCAUGCACUAUGCGCG AUCAGCCAGU	
1706	GCUGAUGAGU G UGUAC		GUACA UGAUGGCAUGCACUAUGCGCG ACUCAUCAGC	
1708	UGAUGAGUGU G UACGU		ACGUA UGAUGGCAUGCACUAUGCGCG ACACUCAUCA	
1718	GUACGUCGUC G AGCUG		CAGCU UGAUGGCAUGCACUAUGCGCG GACGACGUAC	
1723	UCGUCGAGCU G CUCAG		CUGAG UGAUGGCAUGCACUAUGCGCG AGCUCGACGA	
1742	UUUCUUUUAU G UCACG		CGUGA UGAUGGCAUGCACUAUGCGCG AUAAAAGAAA	
1793	CCGGAAGAGU G UCUGG		CCAGA UGAUGGCAUGCACUAUGCGCG ACUCUUCCGG	
1807	GGAGCAAGUU G CAAAG		CUUUG UGAUGGCAUGCACUAUGCGCG AACUUGCUCC	
1834	GACAGCACUU G AAGAG		CUCUU UGAUGGCAUGCACUAUGCGCG AAGUGCUGUC	
1843	UGAAGAGGGU G CAGCU		AGCUG UGAUGGCAUGCACUAUGCGCG ACCCUCUUCA	
1849	GGGUGCAGCU G CGGGA		UCCCG UGAUGGCAUGCACUAUGCGCG AGCUGCACCC	
1858	UGCGGGAGCU G UCGGA		UCCGA UGAUGGCAUGCACUAUGCGCG AGCUCCCGCA	
1898	AGCCAGGCCC G CCCUG		CAGGG UGAUGGCAUGCACUAUGCGCG GGGCCUGGCU	
1903	GGCCCGCCCU G CUGAC		GUCAG UGAUGGCAUGCACUAUGCGCG AGGGCGGGCC	
1906	CCGCCCUGCU G ACGUC		GACGU UGAUGGCAUGCACUAUGCGCG AGCAGGGCGG	
1920	UCCAGACUCC G CUUCA		UGAAG UGAUGGCAUGCACUAUGCGCG GGAGUCUGGA	
1937	CCCCAAGCCU G ACGGG		CCCGU UGAUGGCAUGCACUAUGCGCG AGGCUUGGGG	
1945	CUGACGGGCU G CGGCC		GGCCG UGAUGGCAUGCACUAUGCGCG AGCCCGUCAG	
1951	GGCUGCGGCC G AUUGU		ACAAU UGAUGGCAUGCACUAUGCGCG GGCCGCAGCC	
1955	GCGGCCGAUU G UGAAC		GUUCA UGAUGGCAUGCACUAUGCGCG AAUCGGCCGC	
1957	GGCCGAUUGU G AACAU		AUGUU UGAUGGCAUGCACUAUGCGCG ACAAUCGGCC	
1992	AGAACGUUCC G CAGAG		CUCUG UGAUGGCAUGCACUAUGCGCG GGAACGUUCU	
2009	AAAGAGGGCC G AGCGU		ACGCU UGAUGGCAUGCACUAUGCGCG GGCCCUCUUU	
2023	GUCUCACCUC G AGGGU		ACCCU UGAUGGCAUGCACUAUGCGCG GAGGUGAGAC	
2029	CCUCGAGGGU G AAGGC		GCCUU UGAUGGCAUGCACUAUGCGCG ACCCUCGAGG	
2038	UGAAGGCACU G UUCAG		CUGAA UGAUGGCAUGCACUAUGCGCG AGUGCCUUCA	
2047	UGUUCAGCGU G CUCAA		UUGAG UGAUGGCAUGCACUAUGCGCG ACGCUGAACA	
2057	GCUCAACUAC G AGCGG		CCGCU UGAUGGCAUGCACUAUGCGCG GUAGUUGAGC	
2065	ACGAGCGGGC G CGGCG		CGCCG UGAUGGCAUGCACUAUGCGCG GCCCGCUCGU	
2070	CGGGCGCGGC G CCCCG		CGGGG UGAUGGCAUGCACUAUGCGCG GCCGCGCCCG	

Table 15

2087	CCUCCUGGGC G CCUCU		AGAGG UGAUGGCAUGCACUAUGCGCG GCCCAGGAGG	
2093	GGGCGCCUCU G UGCUG		CAGCA UGAUGGCAUGCACUAUGCGCG AGAGGCGCCC	
2095	GCGCCUCUGU G CUGGG		CCCAG UGAUGGCAUGCACUAUGCGCG ACAGAGGCGC	
2108	GGGCCUGGAC G AUAUC		GAUAU UGAUGGCAUGCACUAUGCGCG GUCCAGGCCC	
2127	AGGGCCUGGC G CACCU		AGGUG UGAUGGCAUGCACUAUGCGCG GCCAGGCCCU	
2137	GCACCUUCGU G CUGCG		CGCAG UGAUGGCAUGCACUAUGCGCG ACGAAGGUGC	
2140	CCUUCGUGCU G CGUGU		ACACG UGAUGGCAUGCACUAUGCGCG AGCACGAAGG	
2144	CGUGCUGCGU G UGCGG		CCGCA UGAUGGCAUGCACUAUGCGCG ACGCAGCACG	
2146	UGCUGCGUGU G CGGGC		GCCCG UGAUGGCAUGCACUAUGCGCG ACACGCAGCA	
2161	CCCAGGACCC G CCGCC		GGCGG UGAUGGCAUGCACUAUGCGCG GGGUCCUGGG	
2164	AGGACCCGCC G CCUGA		UCAGG UGAUGGCAUGCACUAUGCGCG GGCGGGUCCU	
2168	CCCGCCGCCU G AGCUG		CAGCU UGAUGGCAUGCACUAUGCGCG AGGCGGCGGG	
2173	CGCCUGAGCU G UACUU		AAGUA UGAUGGCAUGCACUAUGCGCG AGCUCAGGCG	
2180	GCUGUACUUU G UCAAG		CUUGA UGAUGGCAUGCACUAUGCGCG AAAGUACAGC	
2192	CAAGGUGGAU G UGACG		CGUCA UGAUGGCAUGCACUAUGCGCG AUCCACCUUG	
2194	AGGUGGAUGU G ACGGG		CCCGU UGAUGGCAUGCACUAUGCGCG ACAUCCACCU	
2201	UGUGACGGGC G CGUAC		GUACG UGAUGGCAUGCACUAUGCGCG GCCCGUCACA	
2207	GGGCGCGUAC G ACACC		GGUGU UGAUGGCAUGCACUAUGCGCG GUACGCGCCC	
2243	GGAGGUCAUC G CCAGC		GCUGG UGAUGGCAUGCACUAUGCGCG GAUGACCUCC	
2274	AACACGUACU G CGUGC		GCACG UGAUGGCAUGCACUAUGCGCG AGUACGUGUU	
2278	CGUACUGCGU G CGUCG		CGACG UGAUGGCAUGCACUAUGCGCG ACGCAGUACG	
2288	GCGUCGGUAU G CCGUG		CACGG UGAUGGCAUGCACUAUGCGCG AUACCGACGC	
2306	CCAGAAGGCC G CCCAU		AUGGG UGAUGGCAUGCACUAUGCGCG GGCCUUCUGG	
2322	GGGCACGUCC G CAAGG		CCUUG UGAUGGCAUGCACUAUGCGCG GGACGUGCCC	
2353	UCUCUACCUU G ACAGA		UCUGU UGAUGGCAUGCACUAUGCGCG AAGGUAGAGA	
2374	AGCCGUACAU G CGACA		UGUCG UGAUGGCAUGCACUAUGCGCG AUGUACGGCU	
2376	CCGUACAUGC G ACAGU		ACUGU UGAUGGCAUGCACUAUGCGCG GCAUGUACGG	
2395	UGGCUCACCU G CAGGA		UCCUG UGAUGGCAUGCACUAUGCGCG AGGUGAGCCA	
2410	AGACCAGCCC G CUGAG		CUCAG UGAUGGCAUGCACUAUGCGCG GGGCUGGUCU	
2413	CCAGCCCGCU G AGGGA		UCCCU UGAUGGCAUGCACUAUGCGCG AGCGGGCUGG	
2420	GCUGAGGGAU G CCGUC		GACGG UGAUGGCAUGCACUAUGCGCG AUCCCUCAGC	

Table 15

2432	CGUCGUCAUC G AGCAG		CUGCU UGAUGGCAUGCACUAUGCGCG GAUGACGACG	
2449	GCUCCUCCCU G AAUGA		UCAUU UGAUGGCAUGCACUAUGCGCG AGGGAGGAGC	
2453	CUCCCUGAAU G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG AUUCAGGGAG	
2474	UGGCCUCUUC G ACGUC		GACGU UGAUGGCAUGCACUAUGCGCG GAAGAGGCCA	
2487	GUCUUCCUAC G CUUCA		UGAAG UGAUGGCAUGCACUAUGCGCG GUAGGAAGAC	
2494	UACGCUUCAU G UGCCA		UGGCA UGAUGGCAUGCACUAUGCGCG AUGAAGCGUA	
2496	CGCUUCAUGU G CCACC		GGUGG UGAUGGCAUGCACUAUGCGCG ACAUGAAGCG	
2504	GUGCCACCAC G CCGUG		CACGG UGAUGGCAUGCACUAUGCGCG GUGGUGGCAC	
2509	ACCACGCCGU G CGCAU		AUGCG UGAUGGCAUGCACUAUGCGCG ACGGCGUGGU	
2511	CACGCCGUGC G CAUCA		UGAUG UGAUGGCAUGCACUAUGCGCG GCACGGCGUG	
2538	UACGUCCAGU G CCAGG		CCUGG UGAUGGCAUGCACUAUGCGCG ACUGGACGUA	
2551	AGGGGAUCCC G CAGGG		CCCUG UGAUGGCAUGCACUAUGCGCG GGGAUCCCCU	
2572	UCCUCUCCAC G CUGCU		AGCAG UGAUGGCAUGCACUAUGCGCG GUGGAGAGGA	
2575	UCUCCACGCU G CUCUG		CAGAG UGAUGGCAUGCACUAUGCGCG AGCGUGGAGA	
2580	ACGCUGCUCU G CAGCC		GGCUG UGAUGGCAUGCACUAUGCGCG AGAGCAGCGU	
2587	UCUGCAGCCU G UGCUA		UAGCA UGAUGGCAUGCACUAUGCGCG AGGCUGCAGA	
2589	UGCAGCCUGU G CUACG		CGUAG UGAUGGCAUGCACUAUGCGCG ACAGGCUGCA	
2597	GUGCUACGGC G ACAUG		CAUGU UGAUGGCAUGCACUAUGCGCG GCCGUAGCAC	
2614	AGAACAAGCU G UUUGC		GCAAA UGAUGGCAUGCACUAUGCGCG AGCUUGUUCU	
2618	CAAGCUGUUU G CGGGG		CCCCG UGAUGGCAUGCACUAUGCGCG AAACAGCUUG	
2641	GGGACGGGCU G CUCCU		AGGAG UGAUGGCAUGCACUAUGCGCG AGCCCGUCCC	
2647	GGCUGCUCCU G CGUUU		AAACG UGAUGGCAUGCACUAUGCGCG AGGAGCAGCC	
2660	UUUGGUGGAU G AUUUC		GAAAU UGAUGGCAUGCACUAUGCGCG AUCCACCAAA	
2668	AUGAUUUCUU G UUGGU		ACCAA UGAUGGCAUGCACUAUGCGCG AAGAAAUCAU	
2674	UCUUGUUGGU G ACACC		GGUGU UGAUGGCAUGCACUAUGCGCG ACCAACAAGA	
2693	CCUCACCCAC G CGAAA		UUUCG UGAUGGCAUGCACUAUGCGCG GUGGGUGAGG	
2695	UCACCCACGC G AAAAC		GUUUU UGAUGGCAUGCACUAUGCGCG GCGUGGGUGA	
2721	ACCCUGGUCC G AGGUG		CACCU UGAUGGCAUGCACUAUGCGCG GGACCAGGGU	
2726	GGUCCGAGGU G UCCCU		AGGGA UGAUGGCAUGCACUAUGCGCG ACCUCGGACC	
2732	AGGUGUCCCU G AGUAU		AUACU UGAUGGCAUGCACUAUGCGCG AGGGACACCU	
2742	GAGUAUGGCU G CGUGG		CCACG UGAUGGCAUGCACUAUGCGCG AGCCAUACUC	

Table 15

2749	GCUGCGUGGU G AACUU		AAGUU UGAUGGCAUGCACUAUGCGCG ACCACGCAGC	
2755	UGGUGAACUU .G CGGAA		UUCCG UGAUGGCAUGCACUAUGCGCG AAGUUCACCA	
2770	AGACAGUGGU G AACUU		AAGUU UGAUGGCAUGCACUAUGCGCG ACCACUGUCU	
2780	GAACUUCCCU G UAGAA		UUCUA UGAUGGCAUGCACUAUGCGCG AGGGAAGUUC	
2789	UGUAGAAGAC G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG GUCUUCUACA	
2813	CACGGCUUUU G UUCAG		CUGAA UGAUGGCAUGCACUAUGCGCG AAAAGCCGUG	
2821	UUGUUCAGAU G CCGGC		GCCGG UGAUGGCAUGCACUAUGCGCG AUCUGAACAA	
2847	UUCCCCUGGU G CGGCC		GGCCG UGAUGGCAUGCACUAUGCGCG ACCAGGGGAA	
2854	GGUGCGGCCU G CUGCU		AGCAG UGAUGGCAUGCACUAUGCGCG AGGCCGCACC	
2857	GCGGCCUGCU G CUGGA		UCCAG UGAUGGCAUGCACUAUGCGCG AGCAGGCCGC	
2881	CCCUGGAGGU G CAGAG		CUCUG UGAUGGCAUGCACUAUGCGCG ACCUCCAGGG	
2888	GGUGCAGAGC G ACUAC		GUAGU UGAUGGCAUGCACUAUGCGCG GCUCUGCACC	
2903	CUCCAGCUAU G CCCGG		CCGGG UGAUGGCAUGCACUAUGCGCG AUAGCUGGAG	
2940	ACCUUCAACC G CGGCU		AGCCG UGAUGGCAUGCACUAUGCGCG GGUUGAAGGU	
2965	GGAGGAACAU G CGUCG		CGACG UGAUGGCAUGCACUAUGCGCG AUGUUCCUCC	
2970	AACAUGCGUC G CAAAC		GUUUG UGAUGGCAUGCACUAUGCGCG GACGCAUGUU	
2989	UUGGGGUCUU G CGGCU		AGCCG UGAUGGCAUGCACUAUGCGCG AAGACCCCAA	
2995	UCUUGCGGCU G AAGUG		CACUU UGAUGGCAUGCACUAUGCGCG AGCCGCAAGA	
3000	CGGCUGAAGU G UCACA		UGUGA UGAUGGCAUGCACUAUGCGCG ACUUCAGCCG	
3010	GUCACAGCCU G UUUCU		AGAAA UGAUGGCAUGCACUAUGCGCG AGGCUGUGAC	
3022	UUCUGGAUUU G CAGGU		ACCUG UGAUGGCAUGCACUAUGCGCG AAAUCCAGAA	
3028	AUUUGCAGGU G AACAG		CUGUU UGAUGGCAUGCACUAUGCGCG ACCUGCAAAU	
3046	UCCAGACGGU G UGCAC		GUGCA UGAUGGCAUGCACUAUGCGCG ACCGUCUGGA	
3048	CAGACGGUGU G CACCA		UGGUG UGAUGGCAUGCACUAUGCGCG ACACCGUCUG	
3073	AGAUCCUCCU G CUGCA		UGCAG UGAUGGCAUGCACUAUGCGCG AGGAGGAUCU	
3076	UCCUCCUGCU G CAGGC		GCCUG UGAUGGCAUGCACUAUGCGCG AGCAGGAGGA	
3095	CAGGUUUCAC G CAUGU		ACAUG UGAUGGCAUGCACUAUGCGCG GUGAAACCUG	
3099	UUUCACGCAU G UGUGC		GCACA UGAUGGCAUGCACUAUGCGCG AUGCGUGAAA	
3101	UCACGCAUGU G UGCUG		CAGCA UGAUGGCAUGCACUAUGCGCG ACAUGCGUGA	
3103	ACGCAUGUGU G CUGCA		UGCAG UGAUGGCAUGCACUAUGCGCG ACACAUGCGU	
3106	CAUGUGUGCU G CAGCU		AGCUG UGAUGGCAUGCACUAUGCGCG AGCACACAUG	

Table 15

3154	CAUUUUUCCU G CGCGU		ACGCG UGAUGGCAUGCACUAUGCGCG AGGAAAAAUG	
3156	UUUUUCCUGC G CGUCA		UGACG UGAUGGCAUGCACUAUGCGCG GCAGGAAAAA	
3167	CGUCAUCUCU G ACACG		CGUGU UGAUGGCAUGCACUAUGCGCG AGAGAUGACG	
3183	GCCUCCCUCU G CUACU		AGUAG UGAUGGCAUGCACUAUGCGCG AGAGGGAGGC	
3196	ACUCCAUCCU G AAAGC		GCUUU UGAUGGCAUGCACUAUGCGCG AGGAUGGAGU	
3209	AGCCAAGAAC G CAGGG		CCCUG UGAUGGCAUGCACUAUGCGCG GUUCUUGGCU	
3217	ACGCAGGGAU G UCGCU		AGCGA UGAUGGCAUGCACUAUGCGCG AUCCCUGCGU	
3220	CAGGGAUGUC G CUGGG		CCCAG UGAUGGCAUGCACUAUGCGCG GACAUCCCUG	
3236	GGCCAAGGGC G CCGCC		GGCGG UGAUGGCAUGCACUAUGCGCG GCCCUUGGCC	
3239	CAAGGGCGCC G CCGGC		GCCGG UGAUGGCAUGCACUAUGCGCG GGCGCCCUUG	
3250	CCGGCCCUCU G CCCUC		GAGGG UGAUGGCAUGCACUAUGCGCG AGAGGGCCGG	
3257	UCUGCCCUCC G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG GGAGGGCAGA	
3265	CCGAGGCCGU G CAGUG		CACUG UGAUGGCAUGCACUAUGCGCG ACGGCCUCGG	
3274	UGCAGUGGCU G UGCCA		UGGCA UGAUGGCAUGCACUAUGCGCG AGCCACUGCA	
3276	CAGUGGCUGU G CCACC		GGUGG UGAUGGCAUGCACUAUGCGCG ACAGCCACUG	
3292	AAGCAUUCCU G CUCAA		UUGAG UGAUGGCAUGCACUAUGCGCG AGGAAUGCUU	
3301	UGCUCAAGCU G ACUCG		CGAGU UGAUGGCAUGCACUAUGCGCG AGCUUGAGCA	
3306	AAGCUGACUC G ACACC		GGUGU UGAUGGCAUGCACUAUGCGCG GAGUCAGCUU	
3314	UCGACACCGU G UCACC		GGUGA UGAUGGCAUGCACUAUGCGCG ACGGUGUCGA	
3325	UCACCUACGU G CCACU		AGUGG UGAUGGCAUGCACUAUGCGCG ACGUAGGUGA	
3358	CAGCCCAGAC G CAGCU		AGCUG UGAUGGCAUGCACUAUGCGCG GUCUGGGCUG	
3364	AGACGCAGCU G AGUCG		CGACU UGAUGGCAUGCACUAUGCGCG AGCUGCGUCU	
3385	UCCCGGGGAC G ACGCU		AGCGU UGAUGGCAUGCACUAUGCGCG GUCCCCGGGA	
3388	CGGGGACGAC G CUGAC		GUCAG UGAUGGCAUGCACUAUGCGCG GUCGUCCCCG	
3391	GGACGACGCU G ACUGC		GCAGU UGAUGGCAUGCACUAUGCGCG AGCGUCGUCC	
3395	GACGCUGACU G CCCUG		CAGGG UGAUGGCAUGCACUAUGCGCG AGUCAGCGUC	
3407	CCUGGAGGCC G CAGCC		GGCUG UGAUGGCAUGCACUAUGCGCG GGCCUCCAGG	
3424	ACCCGGCACU G CCCUC		GAGGG UGAUGGCAUGCACUAUGCGCG AGUGCCGGGU	
3453	AUCCUGGACU G AUGGC		GCCAU UGAUGGCAUGCACUAUGCGCG AGUCCAGGAU	
3464	AUGGCCACCC G CCCAC		GUGGG UGAUGGCAUGCACUAUGCGCG GGGUGGCCAU	
3479	CAGCCAGGCC G AGAGC		GCUCU UGAUGGCAUGCACUAUGCGCG GGCCUGGCUG	

Table 15

3501	CAGCAGCCCU G UCACG		CGUGA UGAUGGCAUGCACUAUGCGCG AGGGCUGCUG	
3506	GCCCUGUCAC G CCGGG		CCCGG UGAUGGCAUGCACUAUGCGCG GUGACAGGGC	
3554	ACCCAGGCCC G CACCG		CGGUG UGAUGGCAUGCACUAUGCGCG GGGCCUGGGU	
3559	GGCCCGCACC G CUGGG		CCCAG UGAUGGCAUGCACUAUGCGCG GGUGCGGGCC	
3570	CUGGGAGUCU G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG AGACUCCCAG	
3577	UCUGAGGCCU G AGUGA		UCACU UGAUGGCAUGCACUAUGCGCG AGGCCUCAGA	
3581	AGGCCUGAGU G AGUGU		ACACU UGAUGGCAUGCACUAUGCGCG ACUCAGGCCU	
3585	CUGAGUGAGU G UUUGG		CCAAA UGAUGGCAUGCACUAUGCGCG ACUCACUCAG	
3593	GUGUUUGGCC G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG GGCCAAACAC	
3600	GCCGAGGCCU G CAUGU		ACAUG UGAUGGCAUGCACUAUGCGCG AGGCCUCGGC	
3604	AGGCCUGCAU G UCCGG		CCGGA UGAUGGCAUGCACUAUGCGCG AUGCAGGCCU	
3612	AUGUCCGGCU G AAGGC		GCCUU UGAUGGCAUGCACUAUGCGCG AGCCGGACAU	
3619	GCUGAAGGCU G AGUGU		ACACU UGAUGGCAUGCACUAUGCGCG AGCCUUCAGC	
3623	AAGGCUGAGU G UCCGG		CCGGA UGAUGGCAUGCACUAUGCGCG ACUCAGCCUU	
3631	GUGUCCGGCU G AGGCC		GGCCU UGAUGGCAUGCACUAUGCGCG AGCCGGACAC	
3638	GCUGAGGCCU G AGCGA		UCGCU UGAUGGCAUGCACUAUGCGCG AGGCCUCAGC	
3642	AGGCCUGAGC G AGUGU		ACACU UGAUGGCAUGCACUAUGCGCG GCUCAGGCCU	
3646	CUGAGCGAGU G UCCAG		CUGGA UGAUGGCAUGCACUAUGCGCG ACUCGCUCAG	
3661	GCCAAGGGCU G AGUGU		ACACU UGAUGGCAUGCACUAUGCGCG AGCCCUUGGC	
3665	AGGGCUGAGU G UCCAG		CUGGA UGAUGGCAUGCACUAUGCGCG ACUCAGCCCU	
3678	CAGCACACCU G CCGUC		GACGG UGAUGGCAUGCACUAUGCGCG AGGUGUGCUG	
3705	ACAGGCUGGC G CUCGG		CCGAG UGAUGGCAUGCACUAUGCGCG GCCAGCCUGU	
3789	CCCCAGAUUC G CCAUU		AAUGG UGAUGGCAUGCACUAUGCGCG GAAUCUGGGG	
3795	AUUCGCCAUU G UUCAC		GUGAA UGAUGGCAUGCACUAUGCGCG AAUGGCGAAU	
3806	UUCACCCCUC G CCCUG		CAGGG UGAUGGCAUGCACUAUGCGCG GAGGGGUGAA	
3811	CCCUCGCCCU G CCCUC		GAGGG UGAUGGCAUGCACUAUGCGCG AGGGCGAGGG	
3821	GCCCUCCUUU G CCUUC		GAAGG UGAUGGCAUGCACUAUGCGCG AAAGGAGGGC	
3854	UGGAGACCCU G AGAAG		CUUCU UGAUGGCAUGCACUAUGCGCG AGGGUCUCCA	
3888	AAUUUGGAGU G ACCAA		UUGGU UGAUGGCAUGCACUAUGCGCG ACUCCAAAUU	
3898	GACCAAAGGU G UGCCC		GGGCA UGAUGGCAUGCACUAUGCGCG ACCUUUGGUC	
3900	CCAAAGGUGU G CCCUG		CAGGG UGAUGGCAUGCACUAUGCGCG ACACCUUUGG	

Table 15

3905	GGUGUGCCCU G UACAC		GUGUA UGAUGGCAUGCACUAUGCGCG AGGGCACACC	
3915	GUACACAGGC G AGGAC		GUCCU UGAUGGCAUGCACUAUGCGCG GCCUGUGUAC	
3924	CGAGGACCCU G CACCU		AGGUG UGAUGGCAUGCACUAUGCGCG AGGGUCCUCG	
3944	GGGGGUCCCU G UGGGU		ACCCA UGAUGGCAUGCACUAUGCGCG AGGGACCCCC	
3966	GGGGGGAGGU G CUGUG		CACAG UGAUGGCAUGCACUAUGCGCG ACCUCCCCCC	
3969	GGGAGGUGCU G UGGGA		UCCCA UGAUGGCAUGCACUAUGCGCG AGCACCUCCC	
3985	GUAAAAUACU G AAUAU		AUAUU UGAUGGCAUGCACUAUGCGCG AGUAUUUUAC	
3993	CUGAAUAUAU G AGUUU		AAACU UGAUGGCAUGCACUAUGCGCG AUAUAUUCAG	
4008	UUUCAGUUUU G AAAAA		UUUUU UGAUGGCAUGCACUAUGCGCG AAAACUGAAA	

Seq1 = TERT (Homo sapiens telomerase reverse transcriptase (TERT) mRNA, 4015 bp); Nakamura *et al.*, Science 277 (5328), 955-959 (1997)
Input Sequence = TERT. Cut Site = YG/M or UG/U.
Stem Length = 5/10. Core Sequence = UGAUG GCAUGCACUAUGC GCG

Table 16

Table 16: Human telomerase reverse transcriptase (TERT) DNAzyme and Target Sequence

nt. Position	DNAzyme Sequence	Seq. ID Nos	Substrate	Seq. ID Nos
9	CAGGACGC GGCTAGCTACAACGA AGCGCTGC		GCAGCGCT G GCGTCCTG	
11	AGCAGGAC GGCTAGCTACAACGA GCAGCGCT		AGCGCTGC G GTCCTGCT	
16	TGCGCAGC GGCTAGCTACAACGA AGGACGCA		TGCGTCCT G GCTGCGCA	
19	ACGTGCGC GGCTAGCTACAACGA AGCAGGAC		GTCCTGCT G GCGCACGT	
21	CCACGTGC GGCTAGCTACAACGA GCAGCAGG		CCTGCTGC G GCACGTGG	
23	TCCCACGT GGCTAGCTACAACGA GCGCAGCA		TGCTGCGC A ACGTGGGA	
25	CTTCCCAC GGCTAGCTACAACGA GTGCGCAG		CTGCGCAC G GTGGGAAG	
32	GCCAGGGC GGCTAGCTACAACGA TTCCCACG		CGTGGGAA G GCCCTGGC	
38	GCCGGGGC GGCTAGCTACAACGA CAGGGCTT		AAGCCCTG G GCCCCGGC	
44	GGGGTGGC GGCTAGCTACAACGA CGGGGCCA		TGGCCCCG G GCCACCCC	
47	GCGGGGGT GGCTAGCTACAACGA GGCCGGGG		CCCCGGCC A ACCCCCGC	
53	GGCATCGC GGCTAGCTACAACGA GGGGGTGG		CCACCCCC G GCGATGCC	
56	CGCGGCAT GGCTAGCTACAACGA CGCGGGGG		CCCCCGCG A ATGCCGCG	
58	CGCGCGGC GGCTAGCTACAACGA ATCGCGGG		CCCGCGAT G GCCGCGCG	
61	GAGCGCGC GGCTAGCTACAACGA GGCATCGC		GCGATGCC G GCGCGCTC	
63	GGGAGCGC GGCTAGCTACAACGA GCGGCATC		GATGCCGC G GCGCTCCC	
65	CGGGGAGC GGCTAGCTACAACGA GCGCGGCA		TGCCGCGC G GCTCCCCG	
72	TCGGCAGC GGCTAGCTACAACGA GGGGAGCG		CGCTCCCC G GCTGCCGA	
75	GGCTCGGC GGCTAGCTACAACGA AGCGGGGA		TCCCCGCT G GCCGAGCC	
80	CGCACGGC GGCTAGCTACAACGA TCGGCAGC		GCTGCCGA G GCCGTGCG	
83	GAGCGCAC GGCTAGCTACAACGA GGCTCGGC		GCCGAGCC G GTGCGCTC	
85	GGGAGCGC GGCTAGCTACAACGA ACGGCTCG		CGAGCCGT G GCGCTCCC	
87	CAGGGAGC GGCTAGCTACAACGA GCACGGCT		AGCCGTGC G GCTCCCTG	
94	TGCGCAGC GGCTAGCTACAACGA AGGGAGCG		CGCTCCCT G GCTGCGCA	
97	GGCTGCGC GGCTAGCTACAACGA AGCAGGGA		TCCCTGCT G GCGCAGCC	
99	GTGGCTGC GGCTAGCTACAACGA GCAGCAGG		CCTGCTGC G GCAGCCAC	
102	GTAGTGGC GGCTAGCTACAACGA TGCGCAGC		GCTGCGCA G GCCACTAC	

Table 16

105	GCGGTAGT GGCTAGCTACAACGA GGCTGCGC		GCGCAGCC A ACTACCGC	
108	CTCGCGGT GGCTAGCTACAACGA AGTGGCTG		CAGCCACT A ACCGCGAG	
111	CACCTCGC GGCTAGCTACAACGA GGTAGTGG		CCACTACC G GCGAGGTG	
116	GGCAGCAC GGCTAGCTACAACGA CTCGCGGT		ACCGCGAG G GTGCTGCC	
118	GCGGCAGC GGCTAGCTACAACGA ACCTCGCG		CGCGAGGT G GCTGCCGC	
121	CCAGCGGC GGCTAGCTACAACGA AGCACCTC		GAGGTGCT G GCCGCTGG	
124	TGGCCAGC GGCTAGCTACAACGA GGCAGCAC		GTGCTGCC G GCTGGCCA	
128	AACGTGGC GGCTAGCTACAACGA CAGCGGCA		TGCCGCTG G GCCACGTT	
131	ACGAACGT GGCTAGCTACAACGA GGCCAGCG		CGCTGGCC A ACGTTCGT	
133	GCACGAAC GGCTAGCTACAACGA GTGGCCAG		CTGGCCAC G GTTCGTGC	
137	CGCCGCAC GGCTAGCTACAACGA GAACGTGG		CCACGTTC G GTGCGGCG	
139	GGCGCCGC GGCTAGCTACAACGA ACGAACGT		ACGTTCGT G GCGGCGCC	
142	CCAGGCGC GGCTAGCTACAACGA CGCACGAA		TTCGTGCG G GCGCCTGG	
144	CCCCAGGC GGCTAGCTACAACGA GCCGCACG		CGTGCGGC G GCCTGGGG	
151	CCTGGGGC GGCTAGCTACAACGA CCCAGGCG		CGCCTGGG G GCCCCAGG	
159	CCGCCAGC GGCTAGCTACAACGA CCTGGGGC		GCCCCAGG G GCTGGCGG	
163	CCAGCCGC GGCTAGCTACAACGA CAGCCCTG		CAGGGCTG G GCGGCTGG	
166	GCACCAGC GGCTAGCTACAACGA CGCCAGCC		GGCTGGCG G GCTGGTGC	
170	CGCTGCAC GGCTAGCTACAACGA CAGCCGCC		GGCGGCTG G GTGCAGCG	
172	CGCGCTGC GGCTAGCTACAACGA ACCAGCCG		CGGCTGGT G GCAGCGCG	
175	CCCCGCGC GGCTAGCTACAACGA TGCACCAG		CTGGTGCA G GCGCGGGG	
177	GTCCCCGC GGCTAGCTACAACGA GCTGCACC		GGTGCAGC G GCGGGGAC	
183	CGCCGGGT GGCTAGCTACAACGA CCCCGCGC		GCGCGGGG A ACCCGGCG	
188	AAAGCCGC GGCTAGCTACAACGA CGGGTCCC		GGGACCCG G GCGGCTTT	
191	CGGAAAGC GGCTAGCTACAACGA CGCCGGGT		ACCCGGCG G GCTTTCCG	
198	CAGCGCGC GGCTAGCTACAACGA GGAAAGCC		GGCTTTCC G GCGCGCTG	
200	ACCAGCGC GGCTAGCTACAACGA GCGGAAAG		CTTTCCGC G GCGCTGGT	
202	CCACCAGC GGCTAGCTACAACGA GCGCGGAA		TTCCGCGC G GCTGGTGG	
206	TGGGCCAC GGCTAGCTACAACGA CAGCGCGC		GCGCGCTG G GTGGCCCA	
209	CACTGGGC GGCTAGCTACAACGA CACCAGCG		CGCTGGTG G GCCCAGTG	
214	CCAGGCAC GGCTAGCTACAACGA TGGGCCAC		GTGGCCCA G GTGCCTGG	

Table 16

216	CACCAGGC GGCTAGCTACAACGA ACTGGGCC		GGCCCAGT G GCCTGGTG	
221	ACGCACAC GGCTAGCTACAACGA CAGGCACT		AGTGCCTG G GTGTGCGT	
223	GCACGCAC GGCTAGCTACAACGA ACCAGGCA		TGCCTGGT G GTGCGTGC	
225	GGGCACGC GGCTAGCTACAACGA ACACCAGG		CCTGGTGT G GCGTGCCC	
227	CAGGGCAC GGCTAGCTACAACGA GCACACCA		TGGTGTGC G GTGCCCTG	
229	CCCAGGGC GGCTAGCTACAACGA ACGCACAC		GTGTGCGT G GCCCTGGG	
237	CCGTGCGT GGCTAGCTACAACGA CCCAGGGC		GCCCTGGG A ACGCACGG	
239	GGCCGTGC GGCTAGCTACAACGA GTCCCAGG		CCTGGGAC G GCACGGCC	
241	GCGGCCGT GGCTAGCTACAACGA GCGTCCCA		TGGGACGC A ACGGCCGC	
244	GGGGCGGC GGCTAGCTACAACGA CGTGCGTC		GACGCACG G GCCGCCCC	
247	CGGGGGGC GGCTAGCTACAACGA GGCCGTGC		GCACGGCC G GCCCCCCG	
254	GGGGCGGC GGCTAGCTACAACGA GGGGGGCG		CGCCCCCC G GCCGCCCC	
257	GAGGGGGC GGCTAGCTACAACGA GGCGGGGG		CCCCCGCC G GCCCCCTC	
270	CACCTGGC GGCTAGCTACAACGA GGAAGGAG		CTCCTTCC G GCCAGGTG	
275	CAGGACAC GGCTAGCTACAACGA CTGGCGGA		TCCGCCAG G GTGTCCTG	
277	GGCAGGAC GGCTAGCTACAACGA ACCTGGCG		CGCCAGGT G GTCCTGCC	
282	CTTCAGGC GGCTAGCTACAACGA AGGACACC		GGTGTCCT G GCCTGAAG	
292	CCACCAGC GGCTAGCTACAACGA TCCTTCAG		CTGAAGGA G GCTGGTGG	
296	CGGGCCAC GGCTAGCTACAACGA CAGCTCCT		AGGAGCTG G GTGGCCCG	
299	ACTCGGGC GGCTAGCTACAACGA CACCAGCT		AGCTGGTG G GCCCGAGT	
305	TGCAGCAC GGCTAGCTACAACGA TCGGGCCA		TGGCCCGA G GTGCTGCA	
307	TCTGCAGC GGCTAGCTACAACGA ACTCGGGC		GCCCGAGT G GCTGCAGA	
310	GCCTCTGC GGCTAGCTACAACGA AGCACTCG		CGAGTGCT G GCAGAGGC	
316	CGCACAGC GGCTAGCTACAACGA CTCTGCAG		CTGCAGAG G GCTGTGCG	
319	GCTCGCAC GGCTAGCTACAACGA AGCCTCTG		CAGAGGCT G GTGCGAGC	
321	GCGCTCGC GGCTAGCTACAACGA ACAGCCTC		GAGGCTGT G GCGAGCGC	
325	CGCCGCGC GGCTAGCTACAACGA TCGCACAG		CTGTGCGA G GCGCGGCG	
327	CGCGCCGC GGCTAGCTACAACGA GCTCGCAC		GTGCGAGC G GCGGCGCG	
330	CTTCGCGC GGCTAGCTACAACGA CGCGCTCG		CGAGCGCG G GCGCGAAG	
332	TTCTTCGC GGCTAGCTACAACGA GCCGCGCT		AGCGCGGC G GCGAAGAA	
339	CAGCACGT GGCTAGCTACAACGA TCTTCGCG		CGCGAAGA A ACGTGCTG	

Table 16

341	GCCAGCAC GGCTAGCTACAACGA GTTCTTCG		CGAAGAAC G GTGCTGGC	
343	AGGCCAGC GGCTAGCTACAACGA ACGTTCTT		AAGAACGT G GCTGGCCT	
347	CCGAAGGC GGCTAGCTACAACGA CAGCACGT		ACGTGCTG G GCCTTCGG	
354	CGCGAAGC GGCTAGCTACAACGA CGAAGGCC		GGCCTTCG G GCTTCGCG	
359	AGCAGCGC GGCTAGCTACAACGA GAAGCCGA		TCGGCTTC G GCGCTGCT	
361	CCAGCAGC GGCTAGCTACAACGA GCGAAGCC		GGCTTCGC G GCTGCTGG	
364	CGTCCAGC GGCTAGCTACAACGA AGCGCGAA		TTCGCGCT G GCTGGACG	
369	GGCCCCGT GGCTAGCTACAACGA CCAGCAGC		GCTGCTGG A ACGGGGCC	
374	CCGCGGGC GGCTAGCTACAACGA CCCGTCCA		TGGACGGG G GCCCGCGG	
378	GCCCCCGC GGCTAGCTACAACGA GGGCCCCG		CGGGGCCC G GCGGGGGC	
384	GGGGGGGC GGCTAGCTACAACGA CCCCGCGG		CCGCGGGG G GCCCCCCC	
395	GTGAAGGC GGCTAGCTACAACGA CTCGGGGG		CCCCCGAG G GCCTTCAC	
401	CTGGTGGT GGCTAGCTACAACGA GAAGGCCT		AGGCCTTC A ACCACCAG	
404	ACGCTGGT GGCTAGCTACAACGA GGTGAAGG		CCTTCACC A ACCAGCGT	
408	GCGCACGC GGCTAGCTACAACGA TGGTGGTG		CACCACCA G GCGTGCGC	
410	CTGCGCAC GGCTAGCTACAACGA GCTGGTGG		CCACCAGC G GTGCGCAG	
412	AGCTGCGC GGCTAGCTACAACGA ACGCTGGT		ACCAGCGT G GCGCAGCT	
414	GTAGCTGC GGCTAGCTACAACGA GCACGCTG		CAGCGTGC G GCAGCTAC	
417	CAGGTAGC GGCTAGCTACAACGA TGCGCACG		CGTGCGCA G GCTACCTG	
420	GGGCAGGT GGCTAGCTACAACGA AGCTGCGC		GCGCAGCT A ACCTGCCC	
424	TGTTGGGC GGCTAGCTACAACGA AGGTAGCT		AGCTACCT G GCCCAACA	
429	CACCGTGT GGCTAGCTACAACGA TGGGCAGG		CCTGCCCA A ACACGGTG	
431	GTCACCGT GGCTAGCTACAACGA GTTGGGCA		TGCCCAAC A ACGGTGAC	
434	TCGGTCAC GGCTAGCTACAACGA CGTGTTGG		CCAACACG G GTGACCGA	
437	GCGTCGGT GGCTAGCTACAACGA CACCGTGT		ACACGGTG A ACCGACGC	
441	CAGTGCGT GGCTAGCTACAACGA CGGTCACC		GGTGACCG A ACGCACTG	
443	CGCAGTGC GGCTAGCTACAACGA GTCGGTCA		TGACCGAC G GCACTGCG	
445	CCCGCAGT GGCTAGCTACAACGA GCGTCGGT		ACCGACGC A ACTGCGGG	
448	TCCCCCGC GGCTAGCTACAACGA AGTGCGTC		GACGCACT G GCGGGGGA	
456	CGCCCCGC GGCTAGCTACAACGA TCCCCCGC		GCGGGGGA G GCGGGGCG	
461	CCCCACGC GGCTAGCTACAACGA CCCGCTCC		GGAGCGGG G GCGTGGGG	

Table 16

463	GCCCCCAC GGCTAGCTACAACGA GCCCCGCT		AGCGGGGC G GTGGGGGC	
469	GCAGCAGC GGCTAGCTACAACGA CCCCACGC		GCGTGGGG G GCTGCTGC	
472	GCAGCAGC GGCTAGCTACAACGA AGCCCCCA		TGGGGGCT G GCTGCTGC	
475	GGCGCAGC GGCTAGCTACAACGA AGCAGCCC		GGGCTGCT G GCTGCGCC	
478	CGCGGCGC GGCTAGCTACAACGA AGCAGCAG		CTGCTGCT G GCGCCGCG	
480	CACGCGGC GGCTAGCTACAACGA GCAGCAGC		GCTGCTGC G GCCGCGTG	
483	GCCCACGC GGCTAGCTACAACGA GGCGCAGC		GCTGCGCC G GCGTGGGC	
485	TCGCCCAC GGCTAGCTACAACGA GCGGCGCA		TGCGCCGC G GTGGGCGA	
489	GTCGTCGC GGCTAGCTACAACGA CCACGCGG		CCGCGTGG G GCGACGAC	
492	CACGTCGT GGCTAGCTACAACGA CGCCCACG		CGTGGGCG A ACGACGTG	
495	CAGCACGT GGCTAGCTACAACGA CGTCGCCC		GGGCGACG A ACGTGCTG	
497	ACCAGCAC GGCTAGCTACAACGA GTCGTCGC		GCGACGAC G GTGCTGGT	
499	GAACCAGC GGCTAGCTACAACGA ACGTCGTC		GACGACGT G GCTGGTTC	
503	AGGTGAAC GGCTAGCTACAACGA CAGCACGT		ACGTGCTG G GTTCACCT	
507	CAGCAGGT GGCTAGCTACAACGA GAACCAGC		GCTGGTTC A ACCTGCTG	
511	GTGCCAGC GGCTAGCTACAACGA AGGTGAAC		GTTCACCT G GCTGGCAC	
515	CAGCGTGC GGCTAGCTACAACGA CAGCAGGT		ACCTGCTG G GCACGCTG	
517	CGCAGCGT GGCTAGCTACAACGA GCCAGCAG		CTGCTGGC A ACGCTGCG	
519	CGCGCAGC GGCTAGCTACAACGA GTGCCAGC		GCTGGCAC G GCTGCGCG	
522	GAGCGCGC GGCTAGCTACAACGA AGCGTGCC		GGCACGCT G GCGCGCTC	
524	AAGAGCGC GGCTAGCTACAACGA GCAGCGTG		CACGCTGC G GCGCTCTT	
526	CAAAGAGC GGCTAGCTACAACGA GCGCAGCG		CGCTGCGC G GCTCTTTG	
533	ACCAGCAC GGCTAGCTACAACGA AAAGAGCG		CGCTCTTT G GTGCTGGT	
535	CCACCAGC GGCTAGCTACAACGA ACAAAGAG		CTCTTTGT G GCTGGTGG	
539	GGAGCCAC GGCTAGCTACAACGA CAGCACAA		TTGTGCTG G GTGGCTCC	
542	CTGGGAGC GGCTAGCTACAACGA CACCAGCA		TGCTGGTG G GCTCCCAG	
549	GGCGCAGC GGCTAGCTACAACGA TGGGAGCC		GGCTCCCA G GCTGCGCC	
552	GTAGGCGC GGCTAGCTACAACGA AGCTGGGA		TCCCAGCT G GCGCCTAC	
554	TGGTAGGC GGCTAGCTACAACGA GCAGCTGG		CCAGCTGC G GCCTACCA	
558	CACCTGGT GGCTAGCTACAACGA AGGCGCAG		CTGCGCCT A ACCAGGTG	
563	CCGCACAC GGCTAGCTACAACGA CTGGTAGG		CCTACCAG G GTGTGCGG	

Table 16

565	GCCCGCAC GGCTAGCTACAACGA ACCTGGTA		TACCAGGT G GTGCGGGC	
567	CGGCCCGC GGCTAGCTACAACGA ACACCTGG		CCAGGTGT G GCGGGCCG	
571	GCGGCGGC GGCTAGCTACAACGA CCGCACAC		GTGTGCGG G GCCGCCGC	
574	ACAGCGGC GGCTAGCTACAACGA GGCCCGCA		TGCGGGCC G GCCGCTGT	
577	GGTACAGC GGCTAGCTACAACGA GGCGGCCC		GGGCCGCC G GCTGTACC	
580	GCTGGTAC GGCTAGCTACAACGA AGCGGCGG		CCGCCGCT G GTACCAGC	
582	GAGCTGGT GGCTAGCTACAACGA ACAGCGGC		GCCGCTGT A ACCAGCTC	
586	CGCCGAGC GGCTAGCTACAACGA TGGTACAG		CTGTACCA G GCTCGGCG	
591	GGCAGCGC GGCTAGCTACAACGA CGAGCTGG		CCAGCTCG G GCGCTGCC	
593	GTGGCAGC GGCTAGCTACAACGA GCCGAGCT		AGCTCGGC G GCTGCCAC	
596	TGAGTGGC GGCTAGCTACAACGA AGCGCCGA		TCGGCGCT G GCCACTCA	
599	GCCTGAGT GGCTAGCTACAACGA GGCAGCGC		GCGCTGCC A ACTCAGGC	
605	GGCCGGGC GGCTAGCTACAACGA CTGAGTGG		CCACTCAG G GCCCGGCC	
610	GCGGGGGC GGCTAGCTACAACGA CGGGCCTG		CAGGCCCG G GCCCCCGC	
616	CGTGTGGC GGCTAGCTACAACGA GGGGGCCG		CGGCCCCC G GCCACACG	
619	TAGCGTGT GGCTAGCTACAACGA GGCGGGGG		CCCCCGCC A ACACGCTA	
621	ACTAGCGT GGCTAGCTACAACGA GTGGCGGG		CCCGCCAC A ACGCTAGT	
623	CCACTAGC GGCTAGCTACAACGA GTGTGGCG		CGCCACAC G GCTAGTGG	
627	GGGTCCAC GGCTAGCTACAACGA TAGCGTGT		ACACGCTA G GTGGACCC	
631	TTCGGGGT GGCTAGCTACAACGA CCACTAGC		GCTAGTGG A ACCCCGAA	
640	CCAGACGC GGCTAGCTACAACGA CTTCGGGG		CCCCGAAG G GCGTCTGG	
642	TCCCAGAC GGCTAGCTACAACGA GCCTTCGG		CCGAAGGC G GTCTGGGA	
649	GTTCGCAT GGCTAGCTACAACGA CCCAGACG		CGTCTGGG A ATGCGAAC	
651	CCGTTCGC GGCTAGCTACAACGA ATCCCAGA		TCTGGGAT G GCGAACGG	
655	AGGCCCGT GGCTAGCTACAACGA TCGCATCC		GGATGCGA A ACGGGCCT	
659	TTCCAGGC GGCTAGCTACAACGA CCGTTCGC		GCGAACGG G GCCTGGAA	
666	GCTATGGT GGCTAGCTACAACGA TCCAGGCC		GGCCTGGA A ACCATAGC	
669	GACGCTAT GGCTAGCTACAACGA GGTTCCAG		CTGGAACC A ATAGCGTC	
672	CCTGACGC GGCTAGCTACAACGA TATGGTTC		GAACCATA G GCGTCAGG	
674	TCCCTGAC GGCTAGCTACAACGA GCTATGGT		ACCATAGC G GTCAGGGA	
683	ACCCCGGC GGCTAGCTACAACGA CTCCCTGA		TCAGGGAG G GCCGGGGT	

Table 16

689	AGGGGGAC GGCTAGCTACAACGA CCCGGCCT		AGGCCGGG G GTCCCCCT	
699	TGGCAGGC GGCTAGCTACAACGA CCAGGGGG		CCCCCTGG G GCCTGCCA	
703	GGGCTGGC GGCTAGCTACAACGA AGGCCCAG		CTGGGCCT G GCCAGCCC	
707	CCCGGGGC GGCTAGCTACAACGA TGGCAGGC		GCCTGCCA G GCCCCGGG	
714	CCTCGCAC GGCTAGCTACAACGA CCGGGGCT		AGCCCCGG G GTGCGAGG	
716	CTCCTCGC GGCTAGCTACAACGA ACCCGGGG		CCCCGGGT G GCGAGGAG	
724	CCCCGCGC GGCTAGCTACAACGA CTCCTCGC		GCGAGGAG G GCGCGGGG	
726	GCCCCCGC GGCTAGCTACAACGA GCCTCCTC		GAGGAGGC G GCGGGGGC	
732	GGCACTGC GGCTAGCTACAACGA CCCCGCGC		GCGCGGGG G GCAGTGCC	
735	GCTGGCAC GGCTAGCTACAACGA TGCCCCCG		CGGGGGCA G GTGCCAGC	
737	CGGCTGGC GGCTAGCTACAACGA ACTGCCCC		GGGGCAGT G GCCAGCCG	
741	ACTTCGGC GGCTAGCTACAACGA TGGCACTG		CAGTGCCA G GCCGAAGT	
747	CGGCAGAC GGCTAGCTACAACGA TTCGGCTG		CAGCCGAA G GTCTGCCG	
751	GCAACGGC GGCTAGCTACAACGA AGACTTCG		CGAAGTCT G GCCGTTGC	
754	TGGGCAAC GGCTAGCTACAACGA GGCAGACT		AGTCTGCC G GTTGCCCA	
757	TCTTGGGC GGCTAGCTACAACGA AACGGCAG		CTGCCGTT G GCCCAAGA	
766	GCCTGGGC GGCTAGCTACAACGA CTCTTGGG		CCCAAGAG G GCCCAGGC	
772	CGCCACGC GGCTAGCTACAACGA CTGGGCCT		AGGCCCAG G GCGTGGCG	
774	AGCGCCAC GGCTAGCTACAACGA GCCTGGGC		GCCCAGGC G GTGGCGCT	
777	GGCAGCGC GGCTAGCTACAACGA CACGCCTG		CAGGCGTG G GCGCTGCC	
779	GGGGCAGC GGCTAGCTACAACGA GCCACGCC		GGCGTGGC G GCTGCCCC	
782	TCAGGGGC GGCTAGCTACAACGA AGCGCCAC		GTGGCGCT G GCCCCTGA	
790	GCTCCGGC GGCTAGCTACAACGA TCAGGGGC		GCCCCTGA G GCCGGAGC	
796	GCGTCCGC GGCTAGCTACAACGA TCCGGCTC		GAGCCGGA G GCGGACGC	
800	ACGGGCGT GGCTAGCTACAACGA CCGCTCCG		CGGAGCGG A ACGCCCGT	
802	CAACGGGC GGCTAGCTACAACGA GTCCGCTC		GAGCGGAC G GCCCGTTG	
806	TGCCCAAC GGCTAGCTACAACGA GGGCGTCC		GGACGCCC G GTTGGGCA	
811	ACCCCTGC GGCTAGCTACAACGA CCAACGGG		CCCGTTGG G GCAGGGGT	
817	CCCAGGAC GGCTAGCTACAACGA CCCTGCCC		GGGCAGGG G GTCCTGGG	
824	GGGTGGGC GGCTAGCTACAACGA CCAGGACC		GGTCCTGG G GCCCACCC	
828	GCCCGGGT GGCTAGCTACAACGA GGGCCCAG		CTGGGCCC A ACCCGGGC	

Table 16

834	CGTCCTGC GGCTAGCTACAACGA CCGGGTGG		CCACCCGG G GCAGGACG	
839	CCACGCGT GGCTAGCTACAACGA CCTGCCCG		CGGGCAGG A ACGCGTGG	
841	GTCCACGC GGCTAGCTACAACGA GTCCTGCC		GGCAGGAC G GCGTGGAC	
843	CGGTCCAC GGCTAGCTACAACGA GCGTCCTG		CAGGACGC G GTGGACCG	
847	CACTCGGT GGCTAGCTACAACGA CCACGCGT		ACGCGTGG A ACCGAGTG	
852	ACGGTCAC GGCTAGCTACAACGA TCGGTCCA		TGGACCGA G GTGACCGT	
855	ACCACGGT GGCTAGCTACAACGA CACTCGGT		ACCGAGTG A ACCGTGGT	
858	GAAACCAC GGCTAGCTACAACGA GGTCACTC		GAGTGACC G GTGGTTTC	
861	ACAGAAAC GGCTAGCTACAACGA CACGGTCA		TGACCGTG G GTTTCTGT	
867	CACCACAC GGCTAGCTACAACGA AGAAACCA		TGGTTTCT G GTGTGGTG	
869	GACACCAC GGCTAGCTACAACGA ACAGAAAC		GTTTCTGT G GTGGTGTC	
872	GGTGACAC GGCTAGCTACAACGA CACACAGA		TCTGTGTG G GTGTCACC	
874	CAGGTGAC GGCTAGCTACAACGA ACCACACA		TGTGTGGT G GTCACCTG	
877	TGGCAGGT GGCTAGCTACAACGA GACACCAC		GTGGTGTC A ACCTGCCA	
881	GGTCTGGC GGCTAGCTACAACGA AGGTGACA		TGTCACCT G GCCAGACC	
886	CGGCGGGT GGCTAGCTACAACGA CTGGCAGG		CCTGCCAG A ACCCGCCG	
890	TCTTCGGC GGCTAGCTACAACGA GGGTCTGG		CCAGACCC G GCCGAAGA	
899	GAGGTGGC GGCTAGCTACAACGA TTCTTCGG		CCGAAGAA G GCCACCTC	
902	AAAGAGGT GGCTAGCTACAACGA GGCTTCTT		AAGAAGCC A ACCTCTTT	
915	GAGCGCAC GGCTAGCTACAACGA CCTCCAAA		TTTGGAGG G GTGCGCTC	
917	GAGAGCGC GGCTAGCTACAACGA ACCCTCCA		TGGAGGGT G GCGCTCTC	
919	CAGAGAGC GGCTAGCTACAACGA GCACCCTC		GAGGGTGC G GCTCTCTG	
927	GCGCGTGC GGCTAGCTACAACGA CAGAGAGC		GCTCTCTG G GCACGCGC	
929	TGGCGCGT GGCTAGCTACAACGA GCCAGAGA		TCTCTGGC A ACGCGCCA	
931	AGTGGCGC GGCTAGCTACAACGA GTGCCAGA		TCTGGCAC G GCGCCACT	
933	GGAGTGGC GGCTAGCTACAACGA GCGTGCCA		TGGCACGC G GCCACTCC	
936	GTGGGAGT GGCTAGCTACAACGA GGCGCGTG		CACGCGCC A ACTCCCAC	
942	GGATGGGT GGCTAGCTACAACGA GGGAGTGG		CCACTCCC A ACCCATCC	
946	CCACGGAT GGCTAGCTACAACGA GGGTGGGA		TCCCACCC A ATCCGTGG	
950	CGGCCCAC GGCTAGCTACAACGA GGATGGGT		ACCCATCC G GTGGGCCG	
954	CTGGCGGC GGCTAGCTACAACGA CCACGGAT		ATCCGTGG G GCCGCCAG	

Table 16

957	GTGCTGGC GGCTAGCTACAACGA GGCCCACG		CGTGGGCC G GCCAGCAC	
961	CGTGGTGC GGCTAGCTACAACGA TGGCGGCC		GGCCGCCA G GCACCACG	
963	CGCGTGGT GGCTAGCTACAACGA GCTGGCGG		CCGCCAGC A ACCACGCG	
966	GCCCGCGT GGCTAGCTACAACGA GGTGCTGG		CCAGCACC A ACGCGGGC	
968	GGGCCCGC GGCTAGCTACAACGA GTGGTGCT		AGCACCAC G GCGGGCCC	
972	TGGGGGGC GGCTAGCTACAACGA CCGCGTGG		CCACGCGG G GCCCCCCA	
979	ATGTGGAT GGCTAGCTACAACGA GGGGGGCC		GGCCCCCC A ATCCACAT	
983	CGCGATGT GGCTAGCTACAACGA GGATGGGG		CCCCATCC A ACATCGCG	
985	GCCGCGAT GGCTAGCTACAACGA GTGGATGG		CCATCCAC A ATCGCGGC	
988	GTGGCCGC GGCTAGCTACAACGA GATGTGGA		TCCACATC G GCGGCCAC	
991	GTGGTGGC GGCTAGCTACAACGA CGCGATGT		ACATCGCG G GCCACCAC	
994	GACGTGGT GGCTAGCTACAACGA GGCCGCGA		TCGCGGCC A ACCACGTC	
997	AGGGACGT GGCTAGCTACAACGA GGTGGCCG		CGGCCACC A ACGTCCCT	
999	CCAGGGAC GGCTAGCTACAACGA GTGGTGGC		GCCACCAC G GTCCCTGG	
1008	AGGCGTGT GGCTAGCTACAACGA CCCAGGGA		TCCCTGGG A ACACGCCT	
1010	CAAGGCGT GGCTAGCTACAACGA GTCCCAGG		CCTGGGAC A ACGCCTTG	
1012	GACAAGGC GGCTAGCTACAACGA GTGTCCCA		TGGGACAC G GCCTTGTC	
1017	CGGGGGAC GGCTAGCTACAACGA AAGGCGTG		CACGCCTT G GTCCCCCG	
1025	GCGTACAC GGCTAGCTACAACGA CGGGGGAC		GTCCCCCG G GTGTACGC	
1027	CGGCGTAC GGCTAGCTACAACGA ACCGGGGG		CCCCCGGT G GTACGCCG	
1029	CTCGGCGT GGCTAGCTACAACGA ACACCGGG		CCCGGTGT A ACGCCGAG	
1031	GTCTCGGC GGCTAGCTACAACGA GTACACCG		CGGTGTAC G GCCGAGAC	
1037	TGCTTGGT GGCTAGCTACAACGA CTCGGCGT		ACGCCGAG A ACCAAGCA	
1042	GGAAGTGC GGCTAGCTACAACGA TTGGTCTC		GAGACCAA G GCACTTCC	
1044	GAGGAAGT GGCTAGCTACAACGA GCTTGGTC		GACCAAGC A ACTTCCTC	
1053	TGAGGAGT GGCTAGCTACAACGA AGAGGAAG		CTTCCTCT A ACTCCTCA	
1062	CTTGTCGC GGCTAGCTACAACGA CTGAGGAG		CTCCTCAG G GCGACAAG	
1065	CTCCTTGT GGCTAGCTACAACGA CGCCTGAG		CTCAGGCG A ACAAGGAG	
1072	GCAGCTGC GGCTAGCTACAACGA TCCTTGTC		GACAAGGA G GCAGCTGC	
1075	GCCGCAGC GGCTAGCTACAACGA TGCTCCTT		AAGGAGCA G GCTGCGGC	
1078	AGGGCCGC GGCTAGCTACAACGA AGCTGCTC		GAGCAGCT G GCGGCCCT	

Table 16

1081	AGGAGGGC GGCTAGCTACAACGA CGCAGCTG		CAGCTGCG G GCCCTCCT	
1093	AGCTGAGT GGCTAGCTACAACGA AGGAAGGA		TCCTTCCT A ACTCAGCT	
1098	CAGAGAGC GGCTAGCTACAACGA TGAGTAGG		CCTACTCA G GCTCTCTG	
1108	GGCTGGGC GGCTAGCTACAACGA CTCAGAGA		TCTCTGAG G GCCCAGCC	
1113	AGTCAGGC GGCTAGCTACAACGA TGGGCCTC		GAGGCCCA G GCCTGACT	
1118	GCGCCAGT GGCTAGCTACAACGA CAGGCTGG		CCAGCCTG A ACTGGCGC	
1122	CCGAGCGC GGCTAGCTACAACGA CAGTCAGG		CCTGACTG G GCGCTCGG	
1124	CTCCGAGC GGCTAGCTACAACGA GCCAGTCA		TGACTGGC G GCTCGGAG	
1132	CCACGAGC GGCTAGCTACAACGA CTCCGAGC		GCTCGGAG G GCTCGTGG	
1136	GTCTCCAC GGCTAGCTACAACGA GAGCCTCC		GGAGGCTC G GTGGAGAC	
1142	AAGATGGT GGCTAGCTACAACGA CTCCACGA		TCGTGGAG A ACCATCTT	
1145	AGAAAGAT GGCTAGCTACAACGA GGTCTCCA		TGGAGACC A ATCTTTCT	
1155	CCTGGAAC GGCTAGCTACAACGA CCAGAAAG		CTTTCTGG G GTTCCAGG	
1162	TCCAGGGC GGCTAGCTACAACGA CTGGAACC		GGTTCCAG G GCCCTGGA	
1169	CCTGGCAT GGCTAGCTACAACGA CCAGGGCC		GGCCCTGG A ATGCCAGG	
1171	TCCCTGGC GGCTAGCTACAACGA ATCCAGGG		CCCTGGAT G GCCAGGGA	
1178	CGGGGAGT GGCTAGCTACAACGA CCCTGGCA		TGCCAGGG A ACTCCCCG	
1185	CAACCTGC GGCTAGCTACAACGA GGGGAGTC		GACTCCCC G GCAGGTTG	
1189	GGGGCAAC GGCTAGCTACAACGA CTGCGGGG		CCCCGCAG G GTTGCCCC	
1192	GGCGGGGC GGCTAGCTACAACGA AACCTGCG		CGCAGGTT G GCCCCGCC	
1197	GGGCAGGC GGCTAGCTACAACGA GGGGCAAC		GTTGCCCC G GCCTGCCC	
1201	GCTGGGGC GGCTAGCTACAACGA AGGCGGGG		CCCCGCCT G GCCCCAGC	
1207	AGTAGCGC GGCTAGCTACAACGA TGGGGCAG		CTGCCCCA G GCGCTACT	
1209	CCAGTAGC GGCTAGCTACAACGA GCTGGGGC		GCCCCAGC G GCTACTGG	
1212	TTGCCAGT GGCTAGCTACAACGA AGCGCTGG		CCAGCGCT A ACTGGCAA	
1216	GCATTTGC GGCTAGCTACAACGA CAGTAGCG		CGCTACTG G GCAAATGC	
1220	GGCCGCAT GGCTAGCTACAACGA TTGCCAGT		ACTGGCAA A ATGCGGCC	
1222	GGGGCCGC GGCTAGCTACAACGA ATTTGCCA		TGGCAAAT G GCGGCCCC	
1225	ACAGGGGC GGCTAGCTACAACGA CGCATTTG		CAAATGCG G GCCCCTGT	
1231	CCAGAAAC GGCTAGCTACAACGA AGGGGCCG		CGGCCCCT G GTTTCTGG	
1240	CAAGCAGC GGCTAGCTACAACGA TCCAGAAA		TTTCTGGA G GCTGCTTG	

Table 16

1243	TCCCAAGC GGCTAGCTACAACGA AGCTCCAG		CTGGAGCT G GCTTGGGA	
1251	CGCGTGGT GGCTAGCTACAACGA TCCCAAGC		GCTTGGGA A ACCACGCG	
1254	CTGCGCGT GGCTAGCTACAACGA GGTTCCCA		TGGGAACC A ACGCGCAG	
1256	CACTGCGC GGCTAGCTACAACGA GTGGTTCC		GGAACCAC G GCGCAGTG	
1258	GGCACTGC GGCTAGCTACAACGA GCGTGGTT		AACCACGC G GCAGTGCC	
1261	AGGGGCAC GGCTAGCTACAACGA TGCGCGTG		CACGCGCA G GTGCCCCT	
1263	GTAGGGGC GGCTAGCTACAACGA ACTGCGCG		CGCGCAGT G GCCCCTAC	
1269	CACCCCGT GGCTAGCTACAACGA AGGGGCAC		GTGCCCCT A ACGGGGTG	
1274	AGGAGCAC GGCTAGCTACAACGA CCCGTAGG		CCTACGGG G GTGCTCCT	
1276	TGAGGAGC GGCTAGCTACAACGA ACCCCGTA		TACGGGGT G GCTCCTCA	
1286	CAGTGCGT GGCTAGCTACAACGA CTTGAGGA		TCCTCAAG A ACGCACTG	
1288	GGCAGTGC GGCTAGCTACAACGA GTCTTGAG		CTCAAGAC G GCACTGCC	
1290	CGGGCAGT GGCTAGCTACAACGA GCGTCTTG		CAAGACGC A ACTGCCCG	
1293	CAGCGGGC GGCTAGCTACAACGA AGTGCGTC		GACGCACT G GCCCGCTG	
1297	CTCGCAGC GGCTAGCTACAACGA GGGCAGTG		CACTGCCC G GCTGCGAG	
1300	CAGCTCGC GGCTAGCTACAACGA AGCGGGCA		TGCCCGCT G GCGAGCTG	
1304	ACCGCAGC GGCTAGCTACAACGA TCGCAGCG		CGCTGCGA G GCTGCGGT	
1307	GTGACCGC GGCTAGCTACAACGA AGCTCGCA		TGCGAGCT G GCGGTCAC	
1310	GGGGTGAC GGCTAGCTACAACGA CGCAGCTC		GAGCTGCG G GTCACCCC	
1313	GCTGGGGT GGCTAGCTACAACGA GACCGCAG		CTGCGGTC A ACCCCAGC	
1319	CCGGCTGC GGCTAGCTACAACGA TGGGGTGA		TCACCCCA G GCAGCCGG	
1322	ACACCGGC GGCTAGCTACAACGA TGCTGGGG		CCCCAGCA G GCCGGTGT	
1326	ACAGACAC GGCTAGCTACAACGA CGGCTGCT		AGCAGCCG G GTGTCTGT	
1328	GCACAGAC GGCTAGCTACAACGA ACCGGCTG		CAGCCGGT G GTCTGTGC	
1332	CCGGGCAC GGCTAGCTACAACGA AGACACCG		CGGTGTCT G GTGCCCGG	
1334	TCCCGGGC GGCTAGCTACAACGA ACAGACAC		GTGTCTGT G GCCCGGGA	
1345	CCTGGGGC GGCTAGCTACAACGA TTCTCCCG		CGGGAGAA G GCCCCAGG	
1353	CACAGAGC GGCTAGCTACAACGA CCTGGGGC		GCCCCAGG G GCTCTGTG	
1358	GCCGCCAC GGCTAGCTACAACGA AGAGCCCT		AGGGCTCT G GTGGCGGC	
1361	GGGGCCGC GGCTAGCTACAACGA CACAGAGC		GCTCTGTG G GCGGCCCC	
1364	TCGGGGGC GGCTAGCTACAACGA CGCCACAG		CTGTGGCG G GCCCCCGA	

Table 16

1380	GTCTGTGT GGCTAGCTACAACGA CCTCCTCC		GGAGGAGG A ACACAGAC	
1382	GGGTCTGT GGCTAGCTACAACGA GTCCTCCT		AGGAGGAC A ACAGACCC	
1386	ACGGGGGT GGCTAGCTACAACGA CTGTGTCC		GGACACAG A ACCCCCGT	
1392	CAGGCGAC GGCTAGCTACAACGA GGGGGTCT		AGACCCCC G GTCGCCTG	
1395	CACCAGGC GGCTAGCTACAACGA GACGGGGG		CCCCCGTC G GCCTGGTG	
1400	AGCTGCAC GGCTAGCTACAACGA CAGGCGAC		GTCGCCTG G GTGCAGCT	
1402	GCAGCTGC GGCTAGCTACAACGA ACCAGGCG		CGCCTGGT G GCAGCTGC	
1405	GGAGCAGC GGCTAGCTACAACGA TGCACCAG		CTGGTGCA G GCTGCTCC	
1408	GGCGGAGC GGCTAGCTACAACGA AGCTGCAC		GTGCAGCT G GCTCCGCC	
1413	GTGCTGGC GGCTAGCTACAACGA GGAGCAGC		GCTGCTCC G GCCAGCAC	
1417	TGCTGTGC GGCTAGCTACAACGA TGGCGGAG		CTCCGCCA G GCACAGCA	
1419	GCTGCTGT GGCTAGCTACAACGA GCTGGCGG		CCGCCAGC A ACAGCAGC	
1422	GGGGCTGC GGCTAGCTACAACGA TGTGCTGG		CCAGCACA G GCAGCCCC	
1425	CCAGGGGC GGCTAGCTACAACGA TGCTGTGC		GCACAGCA G GCCCCTGG	
1432	ACACCTGC GGCTAGCTACAACGA CAGGGGCT		AGCCCCTG G GCAGGTGT	
1436	CCGTACAC GGCTAGCTACAACGA CTGCCAGG		CCTGGCAG G GTGTACGG	
1438	AGCCGTAC GGCTAGCTACAACGA ACCTGCCA		TGGCAGGT G GTACGGCT	
1440	GAAGCCGT GGCTAGCTACAACGA ACACCTGC		GCAGGTGT A ACGGCTTC	
1443	CACGAAGC GGCTAGCTACAACGA CGTACACC		GGTGTACG G GCTTCGTG	
1448	GCCCGCAC GGCTAGCTACAACGA GAAGCCGT		ACGGCTTC G GTGCGGGC	
1450	AGGCCCGC GGCTAGCTACAACGA ACGAAGCC		GGCTTCGT G GCGGGCCT	
1454	AGGCAGGC GGCTAGCTACAACGA CCGCACGA		TCGTGCGG G GCCTGCCT	
1458	GCGCAGGC GGCTAGCTACAACGA AGGCCCGC		GCGGGCCT G GCCTGCGC	
1462	GCCGGCGC GGCTAGCTACAACGA AGGCAGGC		GCCTGCCT G GCGCCGGC	
1464	CAGCCGGC GGCTAGCTACAACGA GCAGGCAG		CTGCCTGC G GCCGGCTG	
1468	GCACCAGC GGCTAGCTACAACGA CGGCGCAG		CTGCGCCG G GCTGGTGC	
1472	GGGGGCAC GGCTAGCTACAACGA CAGCCGGC		GCCGGCTG G GTGCCCCC	
1474	CTGGGGGC GGCTAGCTACAACGA ACCAGCCG		CGGCTGGT G GCCCCCAG	
1482	CCAGAGGC GGCTAGCTACAACGA CTGGGGGC		GCCCCCAG G GCCTCTGG	
1491	CCTGGAGC GGCTAGCTACAACGA CCCAGAGG		CCTCTGGG G GCTCCAGG	
1498	CGTTGTGC GGCTAGCTACAACGA CTGGAGCC		GGCTCCAG G GCACAACG	

Table 16

1500	TTCGTTGT GGCTAGCTACAACGA GCCTGGAG		CTCCAGGC A ACAACGAA	
1503	GCGTTCGT GGCTAGCTACAACGA TGTGCCTG		CAGGCACA A ACGAACGC	
1507	AGCGGCGT GGCTAGCTACAACGA TCGTTGTG		CACAACGA A ACGCCGCT	
1509	GAAGCGGC GGCTAGCTACAACGA GTTCGTTG		CAACGAAC G GCCGCTTC	
1512	GAGGAAGC GGCTAGCTACAACGA GGCGTTCG		CGAACGCC G GCTTCCTC	
1524	CTTGGTGT GGCTAGCTACAACGA TCCTGAGG		CCTCAGGA A ACACCAAG	
1526	TTCTTGGT GGCTAGCTACAACGA GTTCCTGA		TCAGGAAC A ACCAAGAA	
1534	AGATGAAC GGCTAGCTACAACGA TTCTTGGT		ACCAAGAA G GTTCATCT	
1538	AGGGAGAT GGCTAGCTACAACGA GAACTTCT		AGAAGTTC A ATCTCCCT	
1552	TGGCATGC GGCTAGCTACAACGA TTCCCCAG		CTGGGGAA G GCATGCCA	
1554	CTTGGCAT GGCTAGCTACAACGA GCTTCCCC		GGGGAAGC A ATGCCAAG	
1556	AGCTTGGC GGCTAGCTACAACGA ATGCTTCC		GGAAGCAT G GCCAAGCT	
1561	GCGAGAGC GGCTAGCTACAACGA TTGGCATG		CATGCCAA G GCTCTCGC	
1567	CCTGCAGC GGCTAGCTACAACGA GAGAGCTT		AAGCTCTC G GCTGCAGG	
1570	GCTCCTGC GGCTAGCTACAACGA AGCGAGAG		CTCTCGCT G GCAGGAGC	
1576	ACGTCAGC GGCTAGCTACAACGA TCCTGCAG		CTGCAGGA G GCTGACGT	
1580	TTCCACGT GGCTAGCTACAACGA CAGCTCCT		AGGAGCTG A ACGTGGAA	
1582	TCTTCCAC GGCTAGCTACAACGA GTCAGCTC		GAGCTGAC G GTGGAAGA	
1589	ACGCTCAT GGCTAGCTACAACGA CTTCCACG		CGTGGAAG A ATGAGCGT	
1593	CCGCACGC GGCTAGCTACAACGA TCATCTTC		GAAGATGA G GCGTGCGG	
1595	TCCCGCAC GGCTAGCTACAACGA GCTCATCT		AGATGAGC G GTGCGGGA	
1597	AGTCCCGC GGCTAGCTACAACGA ACGCTCAT		ATGAGCGT G GCGGGACT	
1602	AGCGCAGT GGCTAGCTACAACGA CCCGCACG		CGTGCGGG A ACTGCGCT	
1605	CCAAGCGC GGCTAGCTACAACGA AGTCCCGC		GCGGGACT G GCGCTTGG	
1607	AGCCAAGC GGCTAGCTACAACGA GCAGTCCC		GGGACTGC G GCTTGGCT	
1612	TGCGCAGC GGCTAGCTACAACGA CAAGCGCA		TGCGCTTG G GCTGCGCA	
1615	TCCTGCGC GGCTAGCTACAACGA AGCCAAGC		GCTTGGCT G GCGCAGGA	
1617	GCTCCTGC GGCTAGCTACAACGA GCAGCCAA		TTGGCTGC G GCAGGAGC	
1623	CCCTGGGC GGCTAGCTACAACGA TCCTGCGC		GCGCAGGA G GCCCAGGG	
1631	CAGCCAAC GGCTAGCTACAACGA CCCTGGGC		GCCCAGGG G GTTGGCTG	
1635	AACACAGC GGCTAGCTACAACGA CAACCCCT		AGGGGTTG G GCTGTGTT	

Table 16

1638	CGGAACAC GGCTAGCTACAACGA AGCCAACC		GGTTGGCT G GTGTTCCG	
1640	GCCGGAAC GGCTAGCTACAACGA ACAGCCAA		TTGGCTGT G GTTCCGGC	
1646	TCTGCGGC GGCTAGCTACAACGA CGGAACAC		GTGTTCCG G GCCGCAGA	
1649	TGCTCTGC GGCTAGCTACAACGA GGCCGGAA		TTCCGGCC G GCAGAGCA	
1654	GACGGTGC GGCTAGCTACAACGA TCTGCGGC		GCCGCAGA G GCACCGTC	
1656	CAGACGGT GGCTAGCTACAACGA GCTCTGCG		CGCAGAGC A ACCGTCTG	
1659	ACGCAGAC GGCTAGCTACAACGA GGTGCTCT		AGAGCACC G GTCTGCGT	
1663	CCTCACGC GGCTAGCTACAACGA AGACGGTG		CACCGTCT G GCGTGAGG	
1665	CTCCTCAC GGCTAGCTACAACGA GCAGACGG		CCGTCTGC G GTGAGGAG	
1673	GCCAGGAT GGCTAGCTACAACGA CTCCTCAC		GTGAGGAG A ATCCTGGC	
1679	AACTTGGC GGCTAGCTACAACGA CAGGATCT		AGATCCTG G GCCAAGTT	
1684	GCAGGAAC GGCTAGCTACAACGA TTGGCCAG		CTGGCCAA G GTTCCTGC	
1690	GCCAGTGC GGCTAGCTACAACGA AGGAACTT		AAGTTCCT G GCACTGGC	
1692	CAGCCAGT GGCTAGCTACAACGA GCAGGAAC		GTTCCTGC A ACTGGCTG	
1696	TCATCAGC GGCTAGCTACAACGA CAGTGCAG		CTGCACTG G GCTGATGA	
1700	ACACTCAT GGCTAGCTACAACGA CAGCCAGT		ACTGGCTG A ATGAGTGT	
1704	GTACACAC GGCTAGCTACAACGA TCATCAGC		GCTGATGA G GTGTGTAC	
1706	ACGTACAC GGCTAGCTACAACGA ACTCATCA		TGATGAGT G GTGTACGT	
1708	CGACGTAC GGCTAGCTACAACGA ACACTCAT		ATGAGTGT G GTACGTCG	
1710	GACGACGT GGCTAGCTACAACGA ACACACTC		GAGTGTGT A ACGTCGTC	
1712	TCGACGAC GGCTAGCTACAACGA GTACACAC		GTGTGTAC G GTCGTCGA	
1715	AGCTCGAC GGCTAGCTACAACGA GACGTACA		TGTACGTC G GTCGAGCT	
1720	TGAGCAGC GGCTAGCTACAACGA TCGACGAC		GTCGTCGA G GCTGCTCA	
1723	ACCTGAGC GGCTAGCTACAACGA AGCTCGAC		GTCGAGCT G GCTCAGGT	
1729	AGAAAGAC GGCTAGCTACAACGA CTGAGCAG		CTGCTCAG G GTCTTTCT	
1740	CGTGACAT GGCTAGCTACAACGA AAAAGAAA		TTTCTTTT A ATGTCACG	
1742	TCCGTGAC GGCTAGCTACAACGA ATAAAAGA		TCTTTTAT G GTCACGGA	
1745	GTCTCCGT GGCTAGCTACAACGA GACATAAA		TTTATGTC A ACGGAGAC	
1751	AACGTGGT GGCTAGCTACAACGA CTCCGTGA		TCACGGAG A ACCACGTT	
1754	TGAAACGT GGCTAGCTACAACGA GGTCTCCG		CGGAGACC A ACGTTTCA	
1756	TTTGAAAC GGCTAGCTACAACGA GTGGTCTC		GAGACCAC G GTTTCAAA	

Table 16

1767	GAGCCTGT GGCTAGCTACAACGA TCTTTTGA		TCAAAAGA A ACAGGCTC	
1771	AAAAGAGC GGCTAGCTACAACGA CTGTTCTT		AAGAACAG G GCTCTTTT	
1782	CTTCCGGT GGCTAGCTACAACGA AGAAAAAG		CTTTTTCT A ACCGGAAG	
1791	CCAGACAC GGCTAGCTACAACGA TCTTCCGG		CCGGAAGA G GTGTCTGG	
1793	CTCCAGAC GGCTAGCTACAACGA ACTCTTCC		GGAAGAGT G GTCTGGAG	
1800	CAACTTGC GGCTAGCTACAACGA TCCAGACA		TGTCTGGA G GCAAGTTG	
1804	TTTGCAAC GGCTAGCTACAACGA TTGCTCCA		TGGAGCAA G GTTGCAAA	
1807	TGCTTTGC GGCTAGCTACAACGA AACTTGCT		AGCAAGTT G GCAAAGCA	
1812	TCCAATGC GGCTAGCTACAACGA TTTGCAAC		GTTGCAAA G GCATTGGA	
1814	ATTCCAAT GGCTAGCTACAACGA GCTTTGCA		TGCAAAGC A ATTGGAAT	
1820	TGTCTGAT GGCTAGCTACAACGA TCCAATGC		GCATTGGA A ATCAGACA	
1825	AGTGCTGT GGCTAGCTACAACGA CTGATTCC		GGAATCAG A ACAGCACT	
1828	TCAAGTGC GGCTAGCTACAACGA TGTCTGAT		ATCAGACA G GCACTTGA	
1830	CTTCAAGT GGCTAGCTACAACGA GCTGTCTG		CAGACAGC A ACTTGAAG	
1841	AGCTGCAC GGCTAGCTACAACGA CCTCTTCA		TGAAGAGG G GTGCAGCT	
1843	GCAGCTGC GGCTAGCTACAACGA ACCCTCTT		AAGAGGGT G GCAGCTGC	
1846	CCCGCAGC GGCTAGCTACAACGA TGCACCCT		AGGGTGCA G GCTGCGGG	
1849	GCTCCCGC GGCTAGCTACAACGA AGCTGCAC		GTGCAGCT G GCGGGAGC	
1855	CCGACAGC GGCTAGCTACAACGA TCCCGCAG		CTGCGGGA G GCTGTCGG	
1858	CTTCCGAC GGCTAGCTACAACGA AGCTCCCG		CGGGAGCT G GTCGGAAG	
1865	ACCTCTGC GGCTAGCTACAACGA TTCCGACA		TGTCGGAA G GCAGAGGT	
1871	TGCCTGAC GGCTAGCTACAACGA CTCTGCTT		AAGCAGAG G GTCAGGCA	
1876	GATGCTGC GGCTAGCTACAACGA CTGACCTC		GAGGTCAG G GCAGCATC	
1879	CCCGATGC GGCTAGCTACAACGA TGCCTGAC		GTCAGGCA G GCATCGGG	
1881	TTCCCGAT GGCTAGCTACAACGA GCTGCCTG		CAGGCAGC A ATCGGGAA	
1889	GGCCTGGC GGCTAGCTACAACGA TTCCCGAT		ATCGGGAA G GCCAGGCC	
1894	GGGCGGGC GGCTAGCTACAACGA CTGGCTTC		GAAGCCAG G GCCCGCCC	
1898	AGCAGGGC GGCTAGCTACAACGA GGGCCTGG		CCAGGCCC G GCCCTGCT	
1903	ACGTCAGC GGCTAGCTACAACGA AGGGCGGG		CCCGCCCT G GCTGACGT	
1907	CTGGACGT GGCTAGCTACAACGA CAGCAGGG		CCCTGCTG A ACGTCCAG	
1909	GTCTGGAC GGCTAGCTACAACGA GTCAGCAG		CTGCTGAC G GTCCAGAC	

Table 16

1915	AGCGGAGT GGCTAGCTACAACGA CTGGACGT		ACGTCCAG A ACTCCGCT	
1920	GATGAAGC GGCTAGCTACAACGA GGAGTCTG		CAGACTCC G GCTTCATC	
1925	TTGGGGAT GGCTAGCTACAACGA GAAGCGGA		TCCGCTTC A ATCCCCAA	
1933	CGTCAGGC GGCTAGCTACAACGA TTGGGGAT		ATCCCCAA G GCCTGACG	
1938	CAGCCCGT GGCTAGCTACAACGA CAGGCTTG		CAAGCCTG A ACGGGCTG	
1942	GCCGCAGC GGCTAGCTACAACGA CCGTCAGG		CCTGACGG G GCTGCGGC	
1945	TCGGCCGC GGCTAGCTACAACGA AGCCCGTC		GACGGGCT G GCGGCCGA	
1948	CAATCGGC GGCTAGCTACAACGA CGCAGCCC		GGGCTGCG G GCCGATTG	
1952	TTCACAAT GGCTAGCTACAACGA CGGCCGCA		TGCGGCCG A ATTGTGAA	
1955	ATGTTCAC GGCTAGCTACAACGA AATCGGCC		GGCCGATT G GTGAACAT	
1959	GTCCATGT GGCTAGCTACAACGA TCACAATC		GATTGTGA A ACATGGAC	
1961	TAGTCCAT GGCTAGCTACAACGA GTTCACAA		TTGTGAAC A ATGGACTA	
1965	GACGTAGT GGCTAGCTACAACGA CCATGTTC		GAACATGG A ACTACGTC	
1968	CACGACGT GGCTAGCTACAACGA AGTCCATG		CATGGACT A ACGTCGTG	
1970	CCCACGAC GGCTAGCTACAACGA GTAGTCCA		TGGACTAC G GTCGTGGG	
1973	GCTCCCAC GGCTAGCTACAACGA GACGTAGT		ACTACGTC G GTGGGAGC	
1979	GTTCTGGC GGCTAGCTACAACGA TCCCACGA		TCGTGGGA G GCCAGAAC	
1985	CGGAACGT GGCTAGCTACAACGA TCTGGCTC		GAGCCAGA A ACGTTCCG	
1987	TGCGGAAC GGCTAGCTACAACGA GTTCTGGC		GCCAGAAC G GTTCCGCA	
1992	TTCTCTGC GGCTAGCTACAACGA GGAACGTT		AACGTTCC G GCAGAGAA	
2006	CGCTCGGC GGCTAGCTACAACGA CCTCTTTT		AAAAGAGG G GCCGAGCG	
2011	TGAGACGC GGCTAGCTACAACGA TCGGCCCT		AGGGCCGA G GCGTCTCA	
2013	GGTGAGAC GGCTAGCTACAACGA GCTCGGCC		GGCCGAGC G GTCTCACC	
2018	CTCGAGGT GGCTAGCTACAACGA GAGACGCT		AGCGTCTC A ACCTCGAG	
2027	GCCTTCAC GGCTAGCTACAACGA CCTCGAGG		CCTCGAGG G GTGAAGGC	
2033	AACAGTGC GGCTAGCTACAACGA CTTCACCC		GGGTGAAG G GCACTGTT	
2035	TGAACAGT GGCTAGCTACAACGA GCCTTCAC		GTGAAGGC A ACTGTTCA	
2038	CGCTGAAC GGCTAGCTACAACGA AGTGCCTT		AAGGCACT G GTTCAGCG	
2043	GAGCACGC GGCTAGCTACAACGA TGAACAGT		ACTGTTCA G GCGTGCTC	
2045	TTGAGCAC GGCTAGCTACAACGA GCTGAACA		TGTTCAGC G GTGCTCAA	
2047	AGTTGAGC GGCTAGCTACAACGA ACGCTGAA		TTCAGCGT G GCTCAACT	

Table 16

2052	CTCGTAGT GGCTAGCTACAACGA TGAGCACG		CGTGCTCA A ACTACGAG	
2055	CCGCTCGT GGCTAGCTACAACGA AGTTGAGC		GCTCAACT A ACGAGCGG	
2059	GCGCCCGC GGCTAGCTACAACGA TCGTAGTT		AACTACGA G GCGGGCGC	
2063	CGCCGCGC GGCTAGCTACAACGA CCGCTCGT		ACGAGCGG G GCGCGGCG	
2065	GGCGCCGC GGCTAGCTACAACGA GCCCGCTC		GAGCGGGC G GCGGCGCC	
2068	CGGGGCGC GGCTAGCTACAACGA CGCGCCCG		CGGGCGCG G GCGCCCCG	
2070	GCCGGGGC GGCTAGCTACAACGA GCCGCGCC		GGCGCGGC G GCCCCGGC	
2076	CAGGAGGC GGCTAGCTACAACGA CGGGGCGC		GCGCCCCG G GCCTCCTG	
2085	AGAGGCGC GGCTAGCTACAACGA CCAGGAGG		CCTCCTGG G GCGCCTCT	
2087	ACAGAGGC GGCTAGCTACAACGA GCCCAGGA		TCCTGGGC G GCCTCTGT	
2093	CCCAGCAC GGCTAGCTACAACGA AGAGGCGC		GCGCCTCT G GTGCTGGG	
2095	GGCCCAGC GGCTAGCTACAACGA ACAGAGGC		GCCTCTGT G GCTGGGCC	
2100	GTCCAGGC GGCTAGCTACAACGA CCAGCACA		TGTGCTGG G GCCTGGAC	
2106	GATATCGT GGCTAGCTACAACGA CCAGGCCC		GGGCCTGG A ACGATATC	
2109	GTGGATAT GGCTAGCTACAACGA CGTCCAGG		CCTGGACG A ATATCCAC	
2111	CTGTGGAT GGCTAGCTACAACGA ATCGTCCA		TGGACGAT A ATCCACAG	
2115	GGCCCTGT GGCTAGCTACAACGA GGATATCG		CGATATCC A ACAGGGCC	
2120	CGCCAGGC GGCTAGCTACAACGA CCTGTGGA		TCCACAGG G GCCTGGCG	
2125	AGGTGCGC GGCTAGCTACAACGA CAGGCCCT		AGGGCCTG G GCGCACCT	
2127	GAAGGTGC GGCTAGCTACAACGA GCCAGGCC		GGCCTGGC G GCACCTTC	
2129	ACGAAGGT GGCTAGCTACAACGA GCGCCAGG		CCTGGCGC A ACCTTCGT	
2135	CGCAGCAC GGCTAGCTACAACGA GAAGGTGC		GCACCTTC G GTGCTGCG	
2137	CACGCAGC GGCTAGCTACAACGA ACGAAGGT		ACCTTCGT G GCTGCGTG	
2140	GCACACGC GGCTAGCTACAACGA AGCACGAA		TTCGTGCT G GCGTGTGC	
2142	CCGCACAC GGCTAGCTACAACGA GCAGCACG		CGTGCTGC G GTGTGCGG	
2144	GCCCGCAC GGCTAGCTACAACGA ACGCAGCA		TGCTGCGT G GTGCGGGC	
2146	GGGCCCGC GGCTAGCTACAACGA ACACGCAG		CTGCGTGT G GCGGGCCC	
2150	TCCTGGGC GGCTAGCTACAACGA CCGCACAC		GTGTGCGG G GCCCAGGA	
2157	CGGCGGGT GGCTAGCTACAACGA CCTGGGCC		GGCCCAGG A ACCCGCCG	
2161	CAGGCGGC GGCTAGCTACAACGA GGGTCCTG		CAGGACCC G GCCGCCTG	
2164	GCTCAGGC GGCTAGCTACAACGA GGCGGGTC		GACCCGCC G GCCTGAGC	

Table 16

2170	AGTACAGC GGCTAGCTACAACGA TCAGGCGG		CCGCCTGA G GCTGTACT	
2173	CAAAGTAC GGCTAGCTACAACGA AGCTCAGG		CCTGAGCT G GTACTTTG	
2175	GACAAAGT GGCTAGCTACAACGA ACAGCTCA		TGAGCTGT A ACTTTGTC	
2180	ACCTTGAC GGCTAGCTACAACGA AAAGTACA		TGTACTTT G GTCAAGGT	
2186	ACATCCAC GGCTAGCTACAACGA CTTGACAA		TTGTCAAG G GTGGATGT	
2190	CGTCACAT GGCTAGCTACAACGA CCACCTTG		CAAGGTGG A ATGTGACG	
2192	CCCGTCAC GGCTAGCTACAACGA ATCCACCT		AGGTGGAT G GTGACGGG	
2195	GCGCCCGT GGCTAGCTACAACGA CACATCCA		TGGATGTG A ACGGGCGC	
2199	GTACGCGC GGCTAGCTACAACGA CCGTCACA		TGTGACGG G GCGCGTAC	
2201	TCGTACGC GGCTAGCTACAACGA GCCCGTCA		TGACGGGC G GCGTACGA	
2203	TGTCGTAC GGCTAGCTACAACGA GCGCCCGT		ACGGGCGC G GTACGACA	
2205	GGTGTCGT GGCTAGCTACAACGA ACGCGCCC		GGGCGCGT A ACGACACC	
2208	GATGGTGT GGCTAGCTACAACGA CGTACGCG		CGCGTACG A ACACCATC	
2210	GGGATGGT GGCTAGCTACAACGA GTCGTACG		CGTACGAC A ACCATCCC	
2213	TGGGGGAT GGCTAGCTACAACGA GGTGTCGT		ACGACACC A ATCCCCCA	
2223	GAGCCTGT GGCTAGCTACAACGA CCTGGGGG		CCCCCAGG A ACAGGCTC	
2227	CCGTGAGC GGCTAGCTACAACGA CTGTCCTG		CAGGACAG G GCTCACGG	
2231	ACCTCCGT GGCTAGCTACAACGA GAGCCTGT		ACAGGCTC A ACGGAGGT	
2237	GCGATGAC GGCTAGCTACAACGA CTCCGTGA		TCACGGAG G GTCATCGC	
2240	CTGGCGAT GGCTAGCTACAACGA GACCTCCG		CGGAGGTC A ATCGCCAG	
2243	ATGCTGGC GGCTAGCTACAACGA GATGACCT		AGGTCATC G GCCAGCAT	
2247	GATGATGC GGCTAGCTACAACGA TGGCGATG		CATCGCCA G GCATCATC	
2249	TTGATGAT GGCTAGCTACAACGA GCTGGCGA		TCGCCAGC A ATCATCAA	
2252	GGTTTGAT GGCTAGCTACAACGA GATGCTGG		CCAGCATC A ATCAAACC	
2257	TCTGGGGT GGCTAGCTACAACGA TTGATGAT		ATCATCAA A ACCCCAGA	
2265	GTACGTGT GGCTAGCTACAACGA TCTGGGGT		ACCCCAGA A ACACGTAC	
2267	CAGTACGT GGCTAGCTACAACGA GTTCTGGG		CCCAGAAC A ACGTACTG	
2269	CGCAGTAC GGCTAGCTACAACGA GTGTTCTG		CAGAACAC G GTACTGCG	
2271	CACGCAGT GGCTAGCTACAACGA ACGTGTTC		GAACACGT A ACTGCGTG	
2274	ACGCACGC GGCTAGCTACAACGA AGTACGTG		CACGTACT G GCGTGCGT	
2276	CGACGCAC GGCTAGCTACAACGA GCAGTACG		CGTACTGC G GTGCGTCG	

Table 16

2278	ACCGACGC GGCTAGCTACAACGA ACGCAGTA		TACTGCGT G GCGTCGGT	
2280	ATACCGAC GGCTAGCTACAACGA GCACGCAG		CTGCGTGC G GTCGGTAT	
2284	CGGCATAC GGCTAGCTACAACGA CGACGCAC		GTGCGTCG G GTATGCCG	
2286	CACGGCAT GGCTAGCTACAACGA ACCGACGC		GCGTCGGT A ATGCCGTG	
2288	ACCACGGC GGCTAGCTACAACGA ATACCGAC		GTCGGTAT G GCCGTGGT	
2291	TGGACCAC GGCTAGCTACAACGA GGCATACC		GGTATGCC G GTGGTCCA	
2294	TTCTGGAC GGCTAGCTACAACGA CACGGCAT		ATGCCGTG G GTCCAGAA	
2303	TGGGCGGC GGCTAGCTACAACGA CTTCTGGA		TCCAGAAG G GCCGCCCA	
2306	CCATGGGC GGCTAGCTACAACGA GGCCTTCT		AGAAGGCC G GCCCATGG	
2310	GTGCCCAT GGCTAGCTACAACGA GGGCGGCC		GGCCGCCC A ATGGGCAC	
2314	GGACGTGC GGCTAGCTACAACGA CCATGGGC		GCCCATGG G GCACGTCC	
2316	GCGGACGT GGCTAGCTACAACGA GCCCATGG		CCATGGGC A ACGTCCGC	
2318	TTGCGGAC GGCTAGCTACAACGA GTGCCCAT		ATGGGCAC G GTCCGCAA	
2322	GGCCTTGC GGCTAGCTACAACGA GGACGTGC		GCACGTCC G GCAAGGCC	
2327	TTGAAGGC GGCTAGCTACAACGA CTTGCGGA		TCCGCAAG G GCCTTCAA	
2337	GACGTGGC GGCTAGCTACAACGA TCTTGAAG		CTTCAAGA G GCCACGTC	
2340	AGAGACGT GGCTAGCTACAACGA GGCTCTTG		CAAGAGCC A ACGTCTCT	
2342	GTAGAGAC GGCTAGCTACAACGA GTGGCTCT		AGAGCCAC G GTCTCTAC	
2348	GTCAAGGT GGCTAGCTACAACGA AGAGACGT		ACGTCTCT A ACCTTGAC	
2354	AGGTCTGT GGCTAGCTACAACGA CAAGGTAG		CTACCTTG A ACAGACCT	
2358	CTGGAGGT GGCTAGCTACAACGA CTGTCAAG		CTTGACAG A ACCTCCAG	
2365	TGTACGGC GGCTAGCTACAACGA TGGAGGTC		GACCTCCA G GCCGTACA	
2368	GCATGTAC GGCTAGCTACAACGA GGCTGGAG		CTCCAGCC G GTACATGC	
2370	TCGCATGT GGCTAGCTACAACGA ACGGCTGG		CCAGCCGT A ACATGCGA	
2372	TGTCGCAT GGCTAGCTACAACGA GTACGGCT		AGCCGTAC A ATGCGACA	
2374	ACTGTCGC GGCTAGCTACAACGA ATGTACGG		CCGTACAT G GCGACAGT	
2377	CGAACTGT GGCTAGCTACAACGA CGCATGTA		TACATGCG A ACAGTTCG	
2380	CCACGAAC GGCTAGCTACAACGA TGTCGCAT		ATGCGACA G GTTCGTGG	
2384	TGAGCCAC GGCTAGCTACAACGA GAACTGTC		GACAGTTC G GTGGCTCA	
2387	AGGTGAGC GGCTAGCTACAACGA CACGAACT		AGTTCGTG G GCTCACCT	
2391	CTGCAGGT GGCTAGCTACAACGA GAGCCACG		CGTGGCTC A ACCTGCAG	

Table 16

2395	TCTCCTGC GGCTAGCTACAACGA AGGTGAGC		GCTCACCT G GCAGGAGA	
2402	GGGCTGGT GGCTAGCTACAACGA CTCCTGCA		TGCAGGAG A ACCAGCCC	
2406	CAGCGGGC GGCTAGCTACAACGA TGGTCTCC		GGAGACCA G GCCCGCTG	
2410	CCCTCAGC GGCTAGCTACAACGA GGGCTGGT		ACCAGCCC G GCTGAGGG	
2418	GACGGCAT GGCTAGCTACAACGA CCCTCAGC		GCTGAGGG A ATGCCGTC	
2420	ACGACGGC GGCTAGCTACAACGA ATCCCTCA		TGAGGGAT G GCCGTCGT	
2423	ATGACGAC GGCTAGCTACAACGA GGCATCCC		GGGATGCC G GTCGTCAT	
2426	TCGATGAC GGCTAGCTACAACGA GACGGCAT		ATGCCGTC G GTCATCGA	
2429	TGCTCGAT GGCTAGCTACAACGA GACGACGG		CCGTCGTC A ATCGAGCA	
2434	AGCTCTGC GGCTAGCTACAACGA TCGATGAC		GTCATCGA G GCAGAGCT	
2439	GGAGGAGC GGCTAGCTACAACGA TCTGCTCG		CGAGCAGA G GCTCCTCC	
2451	GGCCTCAT GGCTAGCTACAACGA TCAGGGAG		CTCCCTGA A ATGAGGCC	
2456	CTGCTGGC GGCTAGCTACAACGA CTCATTCA		TGAATGAG G GCCAGCAG	
2460	GCCACTGC GGCTAGCTACAACGA TGGCCTCA		TGAGGCCA G GCAGTGGC	
2463	GAGGCCAC GGCTAGCTACAACGA TGCTGGCC		GGCCAGCA G GTGGCCTC	
2466	GAAGAGGC GGCTAGCTACAACGA CACTGCTG		CAGCAGTG G GCCTCTTC	
2475	GAAGACGT GGCTAGCTACAACGA CGAAGAGG		CCTCTTCG A ACGTCTTC	
2477	AGGAAGAC GGCTAGCTACAACGA GTCGAAGA		TCTTCGAC G GTCTTCCT	
2485	TGAAGCGT GGCTAGCTACAACGA AGGAAGAC		GTCTTCCT A ACGCTTCA	
2487	CATGAAGC GGCTAGCTACAACGA GTAGGAAG		CTTCCTAC G GCTTCATG	
2492	TGGCACAT GGCTAGCTACAACGA GAAGCGTA		TACGCTTC A ATGTGCCA	
2494	GGTGGCAC GGCTAGCTACAACGA ATGAAGCG		CGCTTCAT G GTGCCACC	
2496	GTGGTGGC GGCTAGCTACAACGA ACATGAAG		CTTCATGT G GCCACCAC	
2499	GGCGTGGT GGCTAGCTACAACGA GGCACATG		CATGTGCC A ACCACGCC	
2502	CACGGCGT GGCTAGCTACAACGA GGTGGCAC		GTGCCACC A ACGCCGTG	
2504	CGCACGGC GGCTAGCTACAACGA GTGGTGGC		GCCACCAC G GCCGTGCG	
2507	ATGCGCAC GGCTAGCTACAACGA GGCGTGGT		ACCACGCC G GTGCGCAT	
2509	TGATGCGC GGCTAGCTACAACGA ACGGCGTG		CACGCCGT G GCGCATCA	
2511	CCTGATGC GGCTAGCTACAACGA GCACGGCG		CGCCGTGC G GCATCAGG	
2513	CCCCTGAT GGCTAGCTACAACGA GCGCACGG		CCGTGCGC A ATCAGGGG	
2520	GGACTTGC GGCTAGCTACAACGA CCCTGATG		CATCAGGG G GCAAGTCC	

Table 16

2524	CGTAGGAC GGCTAGCTACAACGA TTGCCCCT		AGGGGCAA G GTCCTACG	
2529	CTGGACGT GGCTAGCTACAACGA AGGACTTG		CAAGTCCT A ACGTCCAG	
2531	CACTGGAC GGCTAGCTACAACGA GTAGGACT		AGTCCTAC G GTCCAGTG	
2536	CCTGGCAC GGCTAGCTACAACGA TGGACGTA		TACGTCCA G GTGCCAGG	
2538	CCCCTGGC GGCTAGCTACAACGA ACTGGACG		CGTCCAGT G GCCAGGGG	
2546	TGCGGGAT GGCTAGCTACAACGA CCCCTGGC		GCCAGGGG A ATCCCGCA	
2551	AGCCCTGC GGCTAGCTACAACGA GGGATCCC		GGGATCCC G GCAGGGCT	
2556	GATGGAGC GGCTAGCTACAACGA CCTGCGGG		CCCGCAGG G GCTCCATC	
2561	GAGAGGAT GGCTAGCTACAACGA GGAGCCCT		AGGGCTCC A ATCCTCTC	
2570	AGCAGCGT GGCTAGCTACAACGA GGAGAGGA		TCCTCTCC A ACGCTGCT	
2572	AGAGCAGC GGCTAGCTACAACGA GTGGAGAG		CTCTCCAC G GCTGCTCT	
2575	TGCAGAGC GGCTAGCTACAACGA AGCGTGGA		TCCACGCT G GCTCTGCA	
2580	CAGGCTGC GGCTAGCTACAACGA AGAGCAGC		GCTGCTCT G GCAGCCTG	
2583	GCACAGGC GGCTAGCTACAACGA TGCAGAGC		GCTCTGCA G GCCTGTGC	
2587	CGTAGCAC GGCTAGCTACAACGA AGGCTGCA		TGCAGCCT G GTGCTACG	
2589	GCCGTAGC GGCTAGCTACAACGA ACAGGCTG		CAGCCTGT G GCTACGGC	
2592	GTCGCCGT GGCTAGCTACAACGA AGCACAGG		CCTGTGCT A ACGGCGAC	
2595	CATGTCGC GGCTAGCTACAACGA CGTAGCAC		GTGCTACG G GCGACATG	
2598	CTCCATGT GGCTAGCTACAACGA CGCCGTAG		CTACGGCG A ACATGGAG	
2600	TTCTCCAT GGCTAGCTACAACGA GTCGCCGT		ACGGCGAC A ATGGAGAA	
2607	CAGCTTGT GGCTAGCTACAACGA TCTCCATG		CATGGAGA A ACAAGCTG	
2611	CAAACAGC GGCTAGCTACAACGA TTGTTCTC		GAGAACAA G GCTGTTTG	
2614	CCGCAAAC GGCTAGCTACAACGA AGCTTGTT		AACAAGCT G GTTTGCGG	
2618	ATCCCCGC GGCTAGCTACAACGA AAACAGCT		AGCTGTTT G GCGGGGAT	
2624	CGCCGAAT GGCTAGCTACAACGA CCCCGCAA		TTGCGGGG A ATTCGGCG	
2629	CGTCCCGC GGCTAGCTACAACGA CGAATCCC		GGGATTCG G GCGGGACG	
2634	CAGCCCGT GGCTAGCTACAACGA CCCGCCGA		TCGGCGGG A ACGGGCTG	
2638	GGAGCAGC GGCTAGCTACAACGA CCGTCCCG		CGGGACGG G GCTGCTCC	
2641	GCAGGAGC GGCTAGCTACAACGA AGCCCGTC		GACGGGCT G GCTCCTGC	
2647	CCAAACGC GGCTAGCTACAACGA AGGAGCAG		CTGCTCCT G GCGTTTGG	
2649	CACCAAAC GGCTAGCTACAACGA GCAGGAGC		GCTCCTGC G GTTTGGTG	

Table 16

2654	TCATCCAC GGCTAGCTACAACGA CAAACGCA		TGCGTTTG G GTGGATGA	
2658	GAAATCAT GGCTAGCTACAACGA CCACCAAA		TTTGGTGG A ATGATTTC	
2661	CAAGAAAT GGCTAGCTACAACGA CATCCACC		GGTGGATG A ATTTCTTG	
2668	TCACCAAC GGCTAGCTACAACGA AAGAAATC		GATTTCTT G GTTGGTGA	
2672	GGTGTCAC GGCTAGCTACAACGA CAACAAGA		TCTTGTTG G GTGACACC	
2675	TGAGGTGT GGCTAGCTACAACGA CACCAACA		TGTTGGTG A ACACCTCA	
2677	GGTGAGGT GGCTAGCTACAACGA GTCACCAA		TTGGTGAC A ACCTCACC	
2682	GGTGAGGT GGCTAGCTACAACGA GAGGTGTC		GACACCTC A ACCTCACC	
2687	GCGTGGGT GGCTAGCTACAACGA GAGGTGAG		CTCACCTC A ACCCACGC	
2691	TTTCGCGT GGCTAGCTACAACGA GGGTGAGG		CCTCACCC A ACGCGAAA	
2693	GTTTTCGC GGCTAGCTACAACGA GTGGGTGA		TCACCCAC G GCGAAAAC	
2699	AGGAAGGT GGCTAGCTACAACGA TTTCGCGT		ACGCGAAA A ACCTTCCT	
2711	ACCAGGGT GGCTAGCTACAACGA CCTGAGGA		TCCTCAGG A ACCCTGGT	
2717	CCTCGGAC GGCTAGCTACAACGA CAGGGTCC		GGACCCTG G GTCCGAGG	
2724	AGGGACAC GGCTAGCTACAACGA CTCGGACC		GGTCCGAG G GTGTCCCT	
2726	TCAGGGAC GGCTAGCTACAACGA ACCTCGGA		TCCGAGGT G GTCCCTGA	
2734	AGCCATAC GGCTAGCTACAACGA TCAGGGAC		GTCCCTGA G GTATGGCT	
2736	GCAGCCAT GGCTAGCTACAACGA ACTCAGGG		CCCTGAGT A ATGGCTGC	
2739	CACGCAGC GGCTAGCTACAACGA CATACTCA		TGAGTATG G GCTGCGTG	
2742	CACCACGC GGCTAGCTACAACGA AGCCATAC		GTATGGCT G GCGTGGTG	
2744	TTCACCAC GGCTAGCTACAACGA GCAGCCAT		ATGGCTGC G GTGGTGAA	
2747	AAGTTCAC GGCTAGCTACAACGA CACGCAGC		GCTGCGTG G GTGAACTT	
2751	CCGCAAGT GGCTAGCTACAACGA TCACCACG		CGTGGTGA A ACTTGCGG	
2755	TCTTCCGC GGCTAGCTACAACGA AAGTTCAC		GTGAACTT G GCGGAAGA	
2762	ACCACTGT GGCTAGCTACAACGA CTTCCGCA		TGCGGAAG A ACAGTGGT	
2765	TTCACCAC GGCTAGCTACAACGA TGTCTTCC		GGAAGACA G GTGGTGAA	
2768	AAGTTCAC GGCTAGCTACAACGA CACTGTCT		AGACAGTG G GTGAACTT	
2772	AGGGAAGT GGCTAGCTACAACGA TCACCACT		AGTGGTGA A ACTTCCCT	
2780	TCTTCTAC GGCTAGCTACAACGA AGGGAAGT		ACTTCCCT G GTAGAAGA	
2787	GGCCTCGT GGCTAGCTACAACGA CTTCTACA		TGTAGAAG A ACGAGGCC	
2792	CCCAGGGC GGCTAGCTACAACGA CTCGTCTT		AAGACGAG G GCCCTGGG	

Table 16

2799	CGTGCCAC GGCTAGCTACAACGA CCAGGGCC		GGCCCTGG G GTGGCACG	
2802	AGCCGTGC GGCTAGCTACAACGA CACCCAGG		CCTGGGTG G GCACGGCT	
2804	AAAGCCGT GGCTAGCTACAACGA GCCACCCA		TGGGTGGC A ACGGCTTT	
2807	ACAAAAGC GGCTAGCTACAACGA CGTGCCAC		GTGGCACG G GCTTTTGT	
2813	ATCTGAAC GGCTAGCTACAACGA AAAAGCCG		CGGCTTTT G GTTCAGAT	
2819	GCCGGCAT GGCTAGCTACAACGA CTGAACAA		TTGTTCAG A ATGCCGGC	
2821	GGGCCGGC GGCTAGCTACAACGA ATCTGAAC		GTTCAGAT G GCCGGCCC	
2825	CCGTGGGC GGCTAGCTACAACGA CGGCATCT		AGATGCCG G GCCCACGG	
2829	TAGGCCGT GGCTAGCTACAACGA GGGCCGGC		GCCGGCCC A ACGGCCTA	
2832	GAATAGGC GGCTAGCTACAACGA CGTGGGCC		GGCCCACG G GCCTATTC	
2836	AGGGGAAT GGCTAGCTACAACGA AGGCCGTG		CACGGCCT A ATTCCCCT	
2845	GGCCGCAC GGCTAGCTACAACGA CAGGGGAA		TTCCCCTG G GTGCGGCC	
2847	CAGGCCGC GGCTAGCTACAACGA ACCAGGGG		CCCCTGGT G GCGGCCTG	
2850	CAGCAGGC GGCTAGCTACAACGA CGCACCAG		CTGGTGCG G GCCTGCTG	
2854	CCAGCAGC GGCTAGCTACAACGA AGGCCGCA		TGCGGCCT G GCTGCTGG	
2857	TATCCAGC GGCTAGCTACAACGA AGCAGGCC		GGCCTGCT G GCTGGATA	
2862	CCGGGTAT GGCTAGCTACAACGA CCAGCAGC		GCTGCTGG A ATACCCGG	
2864	GTCCGGGT GGCTAGCTACAACGA ATCCAGCA		TGCTGGAT A ACCCGGAC	
2870	TCCAGGGT GGCTAGCTACAACGA CCGGGTAT		ATACCCGG A ACCCTGGA	
2879	CTCTGCAC GGCTAGCTACAACGA CTCCAGGG		CCCTGGAG G GTGCAGAG	
2881	CGCTCTGC GGCTAGCTACAACGA ACCTCCAG		CTGGAGGT G GCAGAGCG	
2886	GTAGTCGC GGCTAGCTACAACGA TCTGCACC		GGTGCAGA G GCGACTAC	
2889	GGAGTAGT GGCTAGCTACAACGA CGCTCTGC		GCAGAGCG A ACTACTCC	
2892	GCTGGAGT GGCTAGCTACAACGA AGTCGCTC		GAGCGACT A ACTCCAGC	
2898	GGCATAGC GGCTAGCTACAACGA TGGAGTAG		CTACTCCA G GCTATGCC	
2901	CCGGGCAT GGCTAGCTACAACGA AGCTGGAG		CTCCAGCT A ATGCCCGG	
2903	GTCCGGGC GGCTAGCTACAACGA ATAGCTGG		CCAGCTAT G GCCCGGAC	
2909	ATGGAGGT GGCTAGCTACAACGA CCGGGCAT		ATGCCCGG A ACCTCCAT	
2915	GCTCTGAT GGCTAGCTACAACGA GGAGGTCC		GGACCTCC A ATCAGAGC	
2921	AGACTGGC GGCTAGCTACAACGA TCTGATGG		CCATCAGA G GCCAGTCT	
2925	GGTGAGAC GGCTAGCTACAACGA TGGCTCTG		CAGAGCCA G GTCTCACC	

Table 16

2930	TTGAAGGT GGCTAGCTACAACGA GAGACTGG		CCAGTCTC A ACCTTCAA	
2937	GCCGCGGT GGCTAGCTACAACGA TGAAGGTG		CACCTTCA A ACCGCGGC	
2940	GAAGCCGC GGCTAGCTACAACGA GGTTGAAG		CTTCAACC G GCGGCTTC	
2943	CTTGAAGC GGCTAGCTACAACGA CGCGGTTG		CAACCGCG G GCTTCAAG	
2951	CTCCCAGC GGCTAGCTACAACGA CTTGAAGC		GCTTCAAG G GCTGGGAG	
2961	ACGCATGT GGCTAGCTACAACGA TCCTCCCA		TGGGAGGA A ACATGCGT	
2963	CGACGCAT GGCTAGCTACAACGA GTTCCTCC		GGAGGAAC A ATGCGTCG	
2965	TGCGACGC GGCTAGCTACAACGA ATGTTCCT		AGGAACAT G GCGTCGCA	
2967	TTTGCGAC GGCTAGCTACAACGA GCATGTTC		GAACATGC G GTCGCAAA	
2970	GAGTTTGC GGCTAGCTACAACGA GACGCATG		CATGCGTC G GCAAACTC	
2974	CAAAGAGT GGCTAGCTACAACGA TTGCGACG		CGTCGCAA A ACTCTTTG	
2984	CGCAAGAC GGCTAGCTACAACGA CCCAAAGA		TCTTTGGG G GTCTTGCG	
2989	TCAGCCGC GGCTAGCTACAACGA AAGACCCC		GGGGTCTT G GCGGCTGA	
2992	ACTTCAGC GGCTAGCTACAACGA CGCAAGAC		GTCTTGCG G GCTGAAGT	
2998	TGTGACAC GGCTAGCTACAACGA TTCAGCCG		CGGCTGAA G GTGTCACA	
3000	GCTGTGAC GGCTAGCTACAACGA ACTTCAGC		GCTGAAGT G GTCACAGC	
3003	CAGGCTGT GGCTAGCTACAACGA GACACTTC		GAAGTGTC A ACAGCCTG	
3006	AAACAGGC GGCTAGCTACAACGA TGTGACAC		GTGTCACA G GCCTGTTT	
3010	CCAGAAAC GGCTAGCTACAACGA AGGCTGTG		CACAGCCT G GTTTCTGG	
3018	CTGCAAAT GGCTAGCTACAACGA CCAGAAAC		GTTTCTGG A ATTTGCAG	
3022	TCACCTGC GGCTAGCTACAACGA AAATCCAG		CTGGATTT G GCAGGTGA	
3026	CTGTTCAC GGCTAGCTACAACGA CTGCAAAT		ATTTGCAG G GTGAACAG	
3030	GAGGCTGT GGCTAGCTACAACGA TCACCTGC		GCAGGTGA A ACAGCCTC	
3033	CTGGAGGC GGCTAGCTACAACGA TGTTCACC		GGTGAACA G GCCTCCAG	
3041	CACACCGT GGCTAGCTACAACGA CTGGAGGC		GCCTCCAG A ACGGTGTG	
3044	GTGCACAC GGCTAGCTACAACGA CGTCTGGA		TCCAGACG G GTGTGCAC	
3046	TGGTGCAC GGCTAGCTACAACGA ACCGTCTG		CAGACGGT G GTGCACCA	
3048	GTTGGTGC GGCTAGCTACAACGA ACACCGTC		GACGGTGT G GCACCAAC	
3050	ATGTTGGT GGCTAGCTACAACGA GCACACCG		CGGTGTGC A ACCAACAT	
3054	GTAGATGT GGCTAGCTACAACGA TGGTGCAC		GTGCACCA A ACATCTAC	
3056	TTGTAGAT GGCTAGCTACAACGA GTTGGTGC		GCACCAAC A ATCTACAA	

Table 16

3060	GATCTTGT GGCTAGCTACAACGA AGATGTTG		CAACATCT A ACAAGATC	
3065	AGGAGGAT GGCTAGCTACAACGA CTTGTAGA		TCTACAAG A ATCCTCCT	
3073	CCTGCAGC GGCTAGCTACAACGA AGGAGGAT		ATCCTCCT G GCTGCAGG	
3076	ACGCCTGC GGCTAGCTACAACGA AGCAGGAG		CTCCTGCT G GCAGGCGT	
3080	CTGTACGC GGCTAGCTACAACGA CTGCAGCA		TGCTGCAG G GCGTACAG	
3082	ACCTGTAC GGCTAGCTACAACGA GCCTGCAG		CTGCAGGC G GTACAGGT	
3084	AAACCTGT GGCTAGCTACAACGA ACGCCTGC		GCAGGCGT A ACAGGTTT	
3088	CGTGAAAC GGCTAGCTACAACGA CTGTACGC		GCGTACAG G GTTTCACG	
3093	ACATGCGT GGCTAGCTACAACGA GAAACCTG		CAGGTTTC A ACGCATGT	
3095	ACACATGC GGCTAGCTACAACGA GTGAAACC		GGTTTCAC G GCATGTGT	
3097	GCACACAT GGCTAGCTACAACGA GCGTGAAA		TTTCACGC A ATGTGTGC	
3099	CAGCACAC GGCTAGCTACAACGA ATGCGTGA		TCACGCAT G GTGTGCTG	
3101	TGCAGCAC GGCTAGCTACAACGA ACATGCGT		ACGCATGT G GTGCTGCA	
3103	GCTGCAGC GGCTAGCTACAACGA ACACATGC		GCATGTGT G GCTGCAGC	
3106	GGAGCTGC GGCTAGCTACAACGA AGCACACA		TGTGTGCT G GCAGCTCC	
3109	ATGGGAGC GGCTAGCTACAACGA TGCAGCAC		GTGCTGCA G GCTCCCAT	
3115	GATGAAAT GGCTAGCTACAACGA GGGAGCTG		CAGCTCCC A ATTTCATC	
3120	TTGCTGAT GGCTAGCTACAACGA GAAATGGG		CCCATTTC A ATCAGCAA	
3124	AAACTTGC GGCTAGCTACAACGA TGATGAAA		TTTCATCA G GCAAGTTT	
3128	TTCCAAAC GGCTAGCTACAACGA TTGCTGAT		ATCAGCAA G GTTTGGAA	
3138	TGTGGGGT GGCTAGCTACAACGA TCTTCCAA		TTGGAAGA A ACCCCACA	
3143	AAAAATGT GGCTAGCTACAACGA GGGGTTCT		AGAACCCC A ACATTTTT	
3145	GGAAAAAT GGCTAGCTACAACGA GTGGGGTT		AACCCCAC A ATTTTTCC	
3154	TGACGCGC GGCTAGCTACAACGA AGGAAAAA		TTTTTCCT G GCGCGTCA	
3156	GATGACGC GGCTAGCTACAACGA GCAGGAAA		TTTCCTGC G GCGTCATC	
3158	GAGATGAC GGCTAGCTACAACGA GCGCAGGA		TCCTGCGC G GTCATCTC	
3161	TCAGAGAT GGCTAGCTACAACGA GACGCGCA		TGCGCGTC A ATCTCTGA	
3168	GGCCGTGT GGCTAGCTACAACGA CAGAGATG		CATCTCTG A ACACGGCC	
3170	GAGGCCGT GGCTAGCTACAACGA GTCAGAGA		TCTCTGAC A ACGGCCTC	
3173	AGGGAGGC GGCTAGCTACAACGA CGTGTCAG		CTGACACG G GCCTCCCT	
3183	GGAGTAGC GGCTAGCTACAACGA AGAGGGAG		CTCCCTCT G GCTACTCC	

Table 16

3186	GATGGAGT GGCTAGCTACAACGA AGCAGAGG		CCTCTGCT A ACTCCATC	
3191	TTCAGGAT GGCTAGCTACAACGA GGAGTAGC		GCTACTCC A ATCCTGAA	
3200	TTCTTGGC GGCTAGCTACAACGA TTTCAGGA		TCCTGAAA G GCCAAGAA	
3207	CCCTGCGT GGCTAGCTACAACGA TCTTGGCT		AGCCAAGA A ACGCAGGG	
3209	ATCCCTGC GGCTAGCTACAACGA GTTCTTGG		CCAAGAAC G GCAGGGAT	
3215	AGCGACAT GGCTAGCTACAACGA CCCTGCGT		ACGCAGGG A ATGTCGCT	
3217	CCAGCGAC GGCTAGCTACAACGA ATCCCTGC		GCAGGGAT G GTCGCTGG	
3220	CCCCCAGC GGCTAGCTACAACGA GACATCCC		GGGATGTC G GCTGGGGG	
3227	CCCTTGGC GGCTAGCTACAACGA CCCCAGCG		CGCTGGGG G GCCAAGGG	
3234	GGCGGCGC GGCTAGCTACAACGA CCTTGGCC		GGCCAAGG G GCGCCGCC	
3236	CCGGCGGC GGCTAGCTACAACGA GCCCTTGG		CCAAGGGC G GCCGCCGG	
3239	GGGCCGGC GGCTAGCTACAACGA GGCGCCCT		AGGGCGCC G GCCGGCCC	
3243	CAGAGGGC GGCTAGCTACAACGA CGGCGGCG		CGCCGCCG G GCCCTCTG	
3250	CGGAGGGC GGCTAGCTACAACGA AGAGGGCC		GGCCCTCT G GCCCTCCG	
3260	TGCACGGC GGCTAGCTACAACGA CTCGGAGG		CCTCCGAG G GCCGTGCA	
3263	CACTGCAC GGCTAGCTACAACGA GGCCTCGG		CCGAGGCC G GTGCAGTG	
3265	GCCACTGC GGCTAGCTACAACGA ACGGCCTC		GAGGCCGT G GCAGTGGC	
3268	ACAGCCAC GGCTAGCTACAACGA TGCACGGC		GCCGTGCA G GTGGCTGT	
3271	GGCACAGC GGCTAGCTACAACGA CACTGCAC		GTGCAGTG G GCTGTGCC	
3274	GGTGGCAC GGCTAGCTACAACGA AGCCACTG		CAGTGGCT G GTGCCACC	
3276	TTGGTGGC GGCTAGCTACAACGA ACAGCCAC		GTGGCTGT G GCCACCAA	
3279	TGCTTGGT GGCTAGCTACAACGA GGCACAGC		GCTGTGCC A ACCAAGCA	
3284	AGGAATGC GGCTAGCTACAACGA TTGGTGGC		GCCACCAA G GCATTCCT	
3286	GCAGGAAT GGCTAGCTACAACGA GCTTGGTG		CACCAAGC A ATTCCTGC	
3292	GCTTGAGC GGCTAGCTACAACGA AGGAATGC		GCATTCCT G GCTCAAGC	
3298	GAGTCAGC GGCTAGCTACAACGA TTGAGCAG		CTGCTCAA G GCTGACTC	
3302	TGTCGAGT GGCTAGCTACAACGA CAGCTTGA		TCAAGCTG A ACTCGACA	
3307	CACGGTGT GGCTAGCTACAACGA CGAGTCAG		CTGACTCG A ACACCGTG	
3309	GACACGGT GGCTAGCTACAACGA GTCGAGTC		GACTCGAC A ACCGTGTC	
3312	GGTGACAC GGCTAGCTACAACGA GGTGTCGA		TCGACACC G GTGTCACC	
3314	TAGGTGAC GGCTAGCTACAACGA ACGGTGTC		GACACCGT G GTCACCTA	

Table 16

3317	ACGTAGGT GGCTAGCTACAACGA GACACGGT		ACCGTGTC A ACCTACGT	
3321	TGGCACGT GGCTAGCTACAACGA AGGTGACA		TGTCACCT A ACGTGCCA	
3323	AGTGGCAC GGCTAGCTACAACGA GTAGGTGA		TCACCTAC G GTGCCACT	
3325	GGAGTGGC GGCTAGCTACAACGA ACGTAGGT		ACCTACGT G GCCACTCC	
3328	CCAGGAGT GGCTAGCTACAACGA GGCACGTA		TACGTGCC A ACTCCTGG	
3337	TGAGTGAC GGCTAGCTACAACGA CCCAGGAG		CTCCTGGG G GTCACTCA	
3340	TCCTGAGT GGCTAGCTACAACGA GACCCCAG		CTGGGGTC A ACTCAGGA	
3347	TGGGCTGT GGCTAGCTACAACGA CCTGAGTG		CACTCAGG A ACAGCCCA	
3350	GTCTGGGC GGCTAGCTACAACGA TGTCCTGA		TCAGGACA G GCCCAGAC	
3356	AGCTGCGT GGCTAGCTACAACGA CTGGGCTG		CAGCCCAG A ACGCAGCT	
3358	TCAGCTGC GGCTAGCTACAACGA GTCTGGGC		GCCCAGAC G GCAGCTGA	
3361	GACTCAGC GGCTAGCTACAACGA TGCGTCTG		CAGACGCA G GCTGAGTC	
3366	CTTCCGAC GGCTAGCTACAACGA TCAGCTGC		GCAGCTGA G GTCGGAAG	
3373	CCGGGAGC GGCTAGCTACAACGA TTCCGACT		AGTCGGAA G GCTCCCGG	
3383	AGCGTCGT GGCTAGCTACAACGA CCCCGGGA		TCCCGGGG A ACGACGCT	
3386	GTCAGCGT GGCTAGCTACAACGA CGTCCCCG		CGGGGACG A ACGCTGAC	
3388	CAGTCAGC GGCTAGCTACAACGA GTCGTCCC		GGGACGAC G GCTGACTG	
3392	AGGGCAGT GGCTAGCTACAACGA CAGCGTCG		CGACGCTG A ACTGCCCT	
3395	TCCAGGGC GGCTAGCTACAACGA AGTCAGCG		CGCTGACT G GCCCTGGA	
3404	GCTGCGGC GGCTAGCTACAACGA CTCCAGGG		CCCTGGAG G GCCGCAGC	
3407	TTGGCTGC GGCTAGCTACAACGA GGCCTCCA		TGGAGGCC G GCAGCCAA	
3410	GGGTTGGC GGCTAGCTACAACGA TGCGGCCT		AGGCCGCA G GCCAACCC	
3414	TGCCGGGT GGCTAGCTACAACGA TGGCTGCG		CGCAGCCA A ACCCGGCA	
3419	GGCAGTGC GGCTAGCTACAACGA CGGGTTGG		CCAACCCG G GCACTGCC	
3421	AGGGCAGT GGCTAGCTACAACGA GCCGGGTT		AACCCGGC A ACTGCCCT	
3424	CTGAGGGC GGCTAGCTACAACGA AGTGCCGG		CCGGCACT G GCCCTCAG	
3432	CTTGAAGT GGCTAGCTACAACGA CTGAGGGC		GCCCTCAG A ACTTCAAG	
3440	AGGATGGT GGCTAGCTACAACGA CTTGAAGT		ACTTCAAG A ACCATCCT	
3443	TCCAGGAT GGCTAGCTACAACGA GGTCTTGA		TCAAGACC A ATCCTGGA	
3450	CCATCAGT GGCTAGCTACAACGA CCAGGATG		CATCCTGG A ACTGATGG	
3454	GTGGCCAT GGCTAGCTACAACGA CAGTCCAG		CTGGACTG A ATGGCCAC	

Table 16

3457	CGGGTGGC GGCTAGCTACAACGA CATCAGTC		GACTGATG G GCCACCCG	
3460	GGGCGGGT GGCTAGCTACAACGA GGCCATCA		TGATGGCC A ACCCGCCC	
3464	CTGTGGGC GGCTAGCTACAACGA GGGTGGCC		GGCCACCC G GCCCACAG	
3468	CTGGCTGT GGCTAGCTACAACGA GGGCGGGT		ACCCGCCC A ACAGCCAG	
3471	GGCCTGGC GGCTAGCTACAACGA TGTGGGCG		CGCCCACA G GCCAGGCC	
3476	CTCTCGGC GGCTAGCTACAACGA CTGGCTGT		ACAGCCAG G GCCGAGAG	
3483	GTGTCTGC GGCTAGCTACAACGA TCTCGGCC		GGCCGAGA G GCAGACAC	
3487	GCTGGTGT GGCTAGCTACAACGA CTGCTCTC		GAGAGCAG A ACACCAGC	
3489	CTGCTGGT GGCTAGCTACAACGA GTCTGCTC		GAGCAGAC A ACCAGCAG	
3493	AGGGCTGC GGCTAGCTACAACGA TGGTGTCT		AGACACCA G GCAGCCCT	
3496	GACAGGGC GGCTAGCTACAACGA TGCTGGTG		CACCAGCA G GCCCTGTC	
3501	GGCGTGAC GGCTAGCTACAACGA AGGGCTGC		GCAGCCCT G GTCACGCC	
3504	CCCGGCGT GGCTAGCTACAACGA GACAGGGC		GCCCTGTC A ACGCCGGG	
3506	AGCCCGGC GGCTAGCTACAACGA GTGACAGG		CCTGTCAC G GCCGGGCT	
3511	CGTAGAGC GGCTAGCTACAACGA CCGGCGTG		CACGCCGG G GCTCTACG	
3516	TGGGACGT GGCTAGCTACAACGA AGAGCCCG		CGGGCTCT A ACGTCCCA	
3518	CCTGGGAC GGCTAGCTACAACGA GTAGAGCC		GGCTCTAC G GTCCCAGG	
3535	TGGGCCGC GGCTAGCTACAACGA CCCTCCCT		AGGGAGGG G GCGGCCCA	
3538	GTGTGGGC GGCTAGCTACAACGA CGCCCCTC		GAGGGGCG G GCCCACAC	
3542	CTGGGTGT GGCTAGCTACAACGA GGGCCGCC		GGCGGCCC A ACACCCAG	
3544	GCCTGGGT GGCTAGCTACAACGA GTGGGCCG		CGGCCCAC A ACCCAGGC	
3550	GTGCGGGC GGCTAGCTACAACGA CTGGGTGT		ACACCCAG G GCCCGCAC	
3554	AGCGGTGC GGCTAGCTACAACGA GGGCCTGG		CCAGGCCC G GCACCGCT	
3556	CCAGCGGT GGCTAGCTACAACGA GCGGGCCT		AGGCCCGC A ACCGCTGG	
3559	CTCCCAGC GGCTAGCTACAACGA GGTGCGGG		CCCGCACC G GCTGGGAG	
3566	CCTCAGAC GGCTAGCTACAACGA TCCCAGCG		CGCTGGGA G GTCTGAGG	
3573	ACTCAGGC GGCTAGCTACAACGA CTCAGACT		AGTCTGAG G GCCTGAGT	
3579	ACACTCAC GGCTAGCTACAACGA TCAGGCCT		AGGCCTGA G GTGAGTGT	
3583	CCAAACAC GGCTAGCTACAACGA TCACTCAG		CTGAGTGA G GTGTTTGG	
3585	GGCCAAAC GGCTAGCTACAACGA ACTCACTC		GAGTGAGT G GTTTGGCC	
3590	GCCTCGGC GGCTAGCTACAACGA CAAACACT		AGTGTTTG G GCCGAGGC	

Table 16

3596	ATGCAGGC GGCTAGCTACAACGA CTCGGCCA		TGGCCGAG G GCCTGCAT	
3600	GGACATGC GGCTAGCTACAACGA AGGCCTCG		CGAGGCCT G GCATGTCC	
3602	CCGGACAT GGCTAGCTACAACGA GCAGGCCT		AGGCCTGC A ATGTCCGG	
3604	AGCCGGAC GGCTAGCTACAACGA ATGCAGGC		GCCTGCAT G GTCCGGCT	
3609	CCTTCAGC GGCTAGCTACAACGA CGGACATG		CATGTCCG G GCTGAAGG	
3616	CACTCAGC GGCTAGCTACAACGA CTTCAGCC		GGCTGAAG G GCTGAGTG	
3621	CCGGACAC GGCTAGCTACAACGA TCAGCCTT		AAGGCTGA G GTGTCCGG	
3623	AGCCGGAC GGCTAGCTACAACGA ACTCAGCC		GGCTGAGT G GTCCGGCT	
3628	GCCTCAGC GGCTAGCTACAACGA CGGACACT		AGTGTCCG G GCTGAGGC	
3634	GCTCAGGC GGCTAGCTACAACGA CTCAGCCG		CGGCTGAG G GCCTGAGC	
3640	ACACTCGC GGCTAGCTACAACGA TCAGGCCT		AGGCCTGA G GCGAGTGT	
3644	CTGGACAC GGCTAGCTACAACGA TCGCTCAG		CTGAGCGA G GTGTCCAG	
3646	GGCTGGAC GGCTAGCTACAACGA ACTCGCTC		GAGCGAGT G GTCCAGCC	
3651	CCCTTGGC GGCTAGCTACAACGA TGGACACT		AGTGTCCA G GCCAAGGG	
3658	CACTCAGC GGCTAGCTACAACGA CCTTGGCT		AGCCAAGG G GCTGAGTG	
3663	CTGGACAC GGCTAGCTACAACGA TCAGCCCT		AGGGCTGA G GTGTCCAG	
3665	TGCTGGAC GGCTAGCTACAACGA ACTCAGCC		GGCTGAGT G GTCCAGCA	
3670	AGGTGTGC GGCTAGCTACAACGA TGGACACT		AGTGTCCA G GCACACCT	
3672	GCAGGTGT GGCTAGCTACAACGA GCTGGACA		TGTCCAGC A ACACCTGC	
3674	CGGCAGGT GGCTAGCTACAACGA GTGCTGGA		TCCAGCAC A ACCTGCCG	
3678	AAGACGGC GGCTAGCTACAACGA AGGTGTGC		GCACACCT G GCCGTCTT	
3681	GTGAAGAC GGCTAGCTACAACGA GGCAGGTG		CACCTGCC G GTCTTCAC	
3687	GGGGAAGT GGCTAGCTACAACGA GAAGACGG		CCGTCTTC A ACTTCCCC	
3695	CAGCCTGT GGCTAGCTACAACGA GGGGAAGT		ACTTCCCC A ACAGGCTG	
3699	GCGCCAGC GGCTAGCTACAACGA CTGTGGGG		CCCCACAG G GCTGGCGC	
3703	CCGAGCGC GGCTAGCTACAACGA CAGCCTGT		ACAGGCTG G GCGCTCGG	
3705	AGCCGAGC GGCTAGCTACAACGA GCCAGCCT		AGGCTGGC G GCTCGGCT	
3710	GGTGGAGC GGCTAGCTACAACGA CGAGCGCC		GGCGCTCG G GCTCCACC	
3715	CCTGGGGT GGCTAGCTACAACGA GGAGCCGA		TCGGCTCC A ACCCCAGG	
3723	AAGCTGGC GGCTAGCTACAACGA CCTGGGGT		ACCCCAGG G GCCAGCTT	
3727	GGAAAAGC GGCTAGCTACAACGA TGGCCCTG		CAGGGCCA G GCTTTTCC	

Table 16

3737	CTCCTGGT GGCTAGCTACAACGA GAGGAAAA		TTTTCCTC A ACCAGGAG	
3744	AGCCGGGC GGCTAGCTACAACGA TCCTGGTG		CACCAGGA G GCCCGGCT	
3749	GTGGAAGC GGCTAGCTACAACGA CGGGCTCC		GGAGCCCG G GCTTCCAC	
3755	TGGGAGT GGCTAGCTACAACGA GGAAGCCG		CGGCTTCC A ACTCCCCA	
3762	TCCTATGT GGCTAGCTACAACGA GGGGAGTG		CACTCCCC A ACATAGGA	
3764	ATTCCTAT GGCTAGCTACAACGA GTGGGGAG		CTCCCCAC A ATAGGAAT	
3770	TGGACTAT GGCTAGCTACAACGA TCCTATGT		ACATAGGA A ATAGTCCA	
3773	GGATGGAC GGCTAGCTACAACGA TATTCCTA		TAGGAATA G GTCCATCC	
3777	CTGGGGAT GGCTAGCTACAACGA GGACTATT		AATAGTCC A ATCCCCAG	
3785	TGGCGAAT GGCTAGCTACAACGA CTGGGGAT		ATCCCCAG A ATTCGCCA	
3789	ACAATGGC GGCTAGCTACAACGA GAATCTGG		CCAGATTC G GCCATTGT	
3792	TGAACAAT GGCTAGCTACAACGA GGCGAATC		GATTCGCC A ATTGTTCA	
3795	GGGTGAAC GGCTAGCTACAACGA AATGGCGA		TCGCCATT G GTTCACCC	
3799	CGAGGGGT GGCTAGCTACAACGA GAACAATG		CATTGTTC A ACCCCTCG	
3806	GGCAGGGC GGCTAGCTACAACGA GAGGGGTG		CACCCCTC G GCCCTGCC	
3811	AGGAGGGC GGCTAGCTACAACGA AGGGCGAG		CTCGCCCT G GCCCTCCT	
3821	TGGAAGGC GGCTAGCTACAACGA AAAGGAGG		CCTCCTTT G GCCTTCCA	
3828	GTGGGGGT GGCTAGCTACAACGA GGAAGGCA		TGCCTTCC A ACCCCCAC	
3834	TGGATGGT GGCTAGCTACAACGA GGGGGTGG		CCACCCCC A ACCATCCA	
3837	ACCTGGAT GGCTAGCTACAACGA GGTGGGGG		CCCCCACC A ATCCAGGT	
3843	GTCTCCAC GGCTAGCTACAACGA CTGGATGG		CCATCCAG G GTGGAGAC	
3849	CTCAGGGT GGCTAGCTACAACGA CTCCACCT		AGGTGGAG A ACCCTGAG	
3861	CCCAGGGT GGCTAGCTACAACGA CCTTCTCA		TGAGAAGG A ACCCTGGG	
3870	CCCAGAGC GGCTAGCTACAACGA TCCCAGGG		CCCTGGGA G GCTCTGGG	
3879	CTCCAAAT GGCTAGCTACAACGA TCCCAGAG		CTCTGGGA A ATTTGGAG	
3886	TTGGTCAC GGCTAGCTACAACGA TCCAAATT		AATTTGGA G GTGACCAA	
3889	CCTTTGGT GGCTAGCTACAACGA CACTCCAA		TTGGAGTG A ACCAAAGG	
3896	GGGCACAC GGCTAGCTACAACGA CTTTGGTC		GACCAAAG G GTGTGCCC	
3898	CAGGGCAC GGCTAGCTACAACGA ACCTTTGG		CCAAAGGT G GTGCCCTG	
3900	TACAGGGC GGCTAGCTACAACGA ACACCTTT		AAAGGTGT G GCCCTGTA	
3905	CTGTGTAC GGCTAGCTACAACGA AGGGCACA		TGTGCCCT G GTACACAG	

Table 16

3907	GCCTGTGT GGCTAGCTACAACGA ACAGGGCA		TGCCCTGT A ACACAGGC	
3909	TCGCCTGT GGCTAGCTACAACGA GTACAGGG		CCCTGTAC A ACAGGCGA	
3913	GTCCTCGC GGCTAGCTACAACGA CTGTGTAC		GTACACAG G GCGAGGAC	
3919	TGCAGGGT GGCTAGCTACAACGA CCTCGCCT		AGGCGAGG A ACCCTGCA	
3924	CCAGGTGC GGCTAGCTACAACGA AGGGTCCT		AGGACCCT G GCACCTGG	
3926	ATCCAGGT GGCTAGCTACAACGA GCAGGGTC		GACCCTGC A ACCTGGAT	
3932	ACCCCCAT GGCTAGCTACAACGA CCAGGTGC		GCACCTGG A ATGGGGGT	
3938	ACAGGGAC GGCTAGCTACAACGA CCCCATCC		GGATGGGG G GTCCCTGT	
3944	TGACCCAC GGCTAGCTACAACGA AGGGACCC		GGGTCCCT G GTGGGTCA	
3948	AATTTGAC GGCTAGCTACAACGA CCACAGGG		CCCTGTGG G GTCAAATT	
3953	CCCCCAAT GGCTAGCTACAACGA TTGACCCA		TGGGTCAA A ATTGGGGG	
3964	CACAGCAC GGCTAGCTACAACGA CTCCCCCC		GGGGGGAG G GTGCTGTG	
3966	CCCACAGC GGCTAGCTACAACGA ACCTCCCC		GGGGAGGT G GCTGTGGG	
3969	ACTCCCAC GGCTAGCTACAACGA AGCACCTC		GAGGTGCT G GTGGGAGT	
3975	TATTTTAC GGCTAGCTACAACGA TCCCACAG		CTGTGGGA G GTAAAATA	
3980	TTCAGTAT GGCTAGCTACAACGA TTTACTCC		GGAGTAAA A ATACTGAA	
3982	TATTCAGT GGCTAGCTACAACGA ATTTTACT		AGTAAAAT A ACTGAATA	
3987	TCATATAT GGCTAGCTACAACGA TCAGTATT		AATACTGA A ATATATGA	
3989	ACTCATAT GGCTAGCTACAACGA ATTCAGTA		TACTGAAT A ATATGAGT	
3991	AAACTCAT GGCTAGCTACAACGA ATATTCAG		CTGAATAT A ATGAGTTT	
3995	TGAAAAAC GGCTAGCTACAACGA TCATATAT		ATATATGA G GTTTTTCA	
4003	TTCAAAAC GGCTAGCTACAACGA TGAAAAAC		GTTTTTCA G GTTTTGAA	

Seq1 = TERT (Homo sapiens telomerase reverse transcriptase (TERT) mRNA, 4015 bp); Nakamura *et al.*, Science 277 (5328), 955-959 (1997)
Cut Site = R/Y (Purine/Pyrimidine)
Stem Length = 8 . Core Sequence = GGCTAGCTACAACGA

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Table 17

Table 17: Anti-TERT HH and G-Cleaver Ribozymes

Alias	Ribozyme Sequence	Length (nt)
HH		
TERT-1051	AGGAGUA CUGAUGAGGCCGUUAGGCCGAA AGGAAGU	36
TERT-1053	UGAGGAG CUGAUGAGGCCGUUAGGCCGAA AGAGGAA	36
TERT-1918	UGAAGCG CUGAUGAGGCCGUUAGGCCGAA AGUCUGG	36
TERT-2383	GAGCCAC CUGAUGAGGCCGUUAGGCCGAA AACUGUC	36
TERT-2485	UGAAGCG CUGAUGAGGCCGUUAGGCCGAA AGGAAGA	36
TERT-2566	GCGUGGA CUGAUGAGGCCGUUAGGCCGAA AGGAUGG	36
TERT-3181	AGUAGCA CUGAUGAGGCCGUUAGGCCGAA AGGGAGG	36
TERT-3691	CUGUGGG CUGAUGAGGCCGUUAGGCCGAA AAGUGAA	36
TERT-3758	AUGUGGG CUGAUGAGGCCGUUAGGCCGAA AGUGGAA	36
TERT-3794	GGUGAAC CUGAUGAGGCCGUUAGGCCGAA AUGGCGA	36
G-Cleaver		
TERT-757	UUGGG UGAUGGCAUGCACUAUGCGCG AACGGCAGAC	36
TERT-2353	UCUGU UGAUGGCAUGCACUAUGCGCG AAGGUAGAGA	36
TERT-3795	GUGAA UGAUGGCAUGCACUAUGCGCG AAUGGCGAAU	36

Table 18

Table 18: Human BACE Hammerhead Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
9	CCACGCGU C CGCAGCCC	1	GGGCUGCG CUGAUGAG X CGAA ACGCGUGG	1776
47	AGCUGGAU U AUGGUGGC	2	GCCACCAU CUGAUGAG X CGAA AUCCAGCU	1777
48	GCUGGAUU A UGGUGGCC	3	GGCCACCA CUGAUGAG X CGAA AAUCCAGC	1778
93	GGAGCCCU U GCCCCUGC	4	GCAGGGGC CUGAUGAG X CGAA AGGGCUCC	1779
163	CCGCCCCU C CCAGCCCC	5	GGGGCUGG CUGAUGAG X CGAA AGGGGCGG	1780
221	GCCGAUGU A GCGGGCUC	6	GAGCCCGC CUGAUGAG X CGAA ACAUCGGC	1781
229	AGCGGGCU C CGGAUCCC	7	GGGAUCCG CUGAUGAG X CGAA AGCCCGCU	1782
235	CUCCGGAU C CCAGCCUC	8	GAGGCUGG CUGAUGAG X CGAA AUCCGGAG	1783
243	CCCAGCCU C UCCCCUGC	9	GCAGGGGA CUGAUGAG X CGAA AGGCUGGG	1784
245	CAGCCUCU C CCCUGCUC	10	GAGCAGGG CUGAUGAG X CGAA AGAGGCUG	1785
253	CCCCUGCU C CCGUGCUC	11	GAGCACGG CUGAUGAG X CGAA AGCAGGGG	1786
261	CCCGUGCU C UGCGGAUC	12	GAUCCGCA CUGAUGAG X CGAA AGCACGGG	1787
269	CUGCGGAU C UCCCCUGA	13	UCAGGGGA CUGAUGAG X CGAA AUCCGCAG	1788
271	GCGGAUCU C CCCUGACC	14	GGUCAGGG CUGAUGAG X CGAA AGAUCCGC	1789
283	UGACCGCU C UCCACAGC	15	GCUGUGGA CUGAUGAG X CGAA AGCGGUCA	1790
285	ACCGCUCU C CACAGCCC	16	GGGCUGUG CUGAUGAG X CGAA AGAGCGGU	1791
334	CCUGGCGU C CUGAUGCC	17	GGCAUCAG CUGAUGAG X CGAA ACGCCAGG	1792
351	CCCAAGCU C CCUCUCCU	18	AGGAGAGG CUGAUGAG X CGAA AGCUUGGG	1793
355	AGCUCCCU C UCCUGAGA	19	UCUCAGGA CUGAUGAG X CGAA AGGGAGCU	1794
357	CUCCCUCU C CUGAGAAG	20	CUUCUCAG CUGAUGAG X CGAA AGAGGGAG	1795
386	CCCAGACU U GGGGGCAG	21	CUGCCCCC CUGAUGAG X CGAA AGUCUGGG	1796
477	CCCUGGCU C CUGCUGUG	22	CACAGCAG CUGAUGAG X CGAA AGCCAGGG	1797
531	CACGGCAU C CGGCUGCC	23	GGCAGCCG CUGAUGAG X CGAA AUGCCGUG	1798
632	GGGCAGCU U UGUGGAGA	24	UCUCCACA CUGAUGAG X CGAA AGCUGCCC	1799
633	GGCAGCUU U GUGGAGAU	25	AUCUCCAC CUGAUGAG X CGAA AAGCUGCC	1800
665	GGGCAAGU C GGGGCAGG	26	CCUGCCCC CUGAUGAG X CGAA ACUUGCCC	1801
677	GCAGGGCU A CUACGUGG	27	CCACGUAG CUGAUGAG X CGAA AGCCCUGC	1802
680	GGGCUACU A CGUGGAGA	28	UCUCCACG CUGAUGAG X CGAA AGUAGCCC	1803
717	CAGACGCU C AACAUCCU	29	AGGAUGUU CUGAUGAG X CGAA AGCGUCUG	1804
723	CUCAACAU C CUGGUGGA	30	UCCACCAG CUGAUGAG X CGAA AUGUUGAG	1805
733	UGGUGGAU A CAGGCAGC	31	GCUGCCUG CUGAUGAG X CGAA AUCCACCA	1806
745	GCAGCAGU A ACUUUGCA	32	UGCAAAGU CUGAUGAG X CGAA ACUGCUGC	1807
749	CAGUAACU U UGCAGUGG	33	CCACUGCA CUGAUGAG X CGAA AGUUACUG	1808
750	AGUAACUU U GCAGUGGG	34	CCCACUGC CUGAUGAG X CGAA AAGUUACU	1809
776	CCACCCCU U CCUGCAUC	35	GAUGCAGG CUGAUGAG X CGAA AGGGGUGG	1810
777	CACCCCUU C CUGCAUCG	36	CGAUGCAG CUGAUGAG X CGAA AAGGGGUG	1811
784	UCCUGCAU C GCUACUAC	37	GUAGUAGC CUGAUGAG X CGAA AUGCAGGA	1812
788	GCAUCGCU A CUACCAGA	38	UCUGGUAG CUGAUGAG X CGAA AGCGAUGC	1813
791	UCGCUACU A CCAGAGGC	39	GCCUCUGG CUGAUGAG X CGAA AGUAGCGA	1814
806	GCAGCUGU C CAGCACAU	40	AUGUGCUG CUGAUGAG X CGAA ACAGCUGC	1815
815	CAGCACAU A CCGGGACC	41	GGUCCCGG CUGAUGAG X CGAA AUGUGCUG	1816
825	CGGGACCU C CGGAAGGG	42	CCCUUCCG CUGAUGAG X CGAA AGGUCCCG	1817
839	GGGUGUGU A UGUGCCCU	43	AGGGCACA CUGAUGAG X CGAA ACACACCC	1818
848	UGUGCCCU A CACCCAGG	44	CCUGGGUG CUGAUGAG X CGAA AGGGCACA	1819
891	GACCUGGU A AGCAUCCC	45	GGGAUGCU CUGAUGAG X CGAA ACCAGGUC	1820
897	GUAAGCAU C CCCCAUGG	46	CCAUGGGG CUGAUGAG X CGAA AUGCUUAC	1821
915	CCCAACGU C ACUGUGCG	47	CGCACAGU CUGAUGAG X CGAA ACGUUGGG	1822

Table 18

933	GCCAACAU U GCUGCCAU	48	AUGGCAGC CUGAUGAG X CGAA AUGUUGGC	1823
942	GCUGCCAU C ACUGAAUC	49	GAUUCAGU CUGAUGAG X CGAA AUGGCAGC	1824
950	CACUGAAU C AGACAAGU	50	ACUUGUCU CUGAUGAG X CGAA AUUCAGUG	1825
959	AGACAAGU U CUUCAUCA	51	UGAUGAAG CUGAUGAG X CGAA ACUUGUCU	1826
960	GACAAGUU C UUCAUCAA	52	UUGAUGAA CUGAUGAG X CGAA AACUUGUC	1827
962	CAAGUUCU U CAUCAACG	53	CGUUGAUG CUGAUGAG X CGAA AGAACUUG	1828
963	AAGUUCUU C AUCAACGG	54	CCGUUGAU CUGAUGAG X CGAA AAGAACUU	1829
966	UUCUUCAU C AACGGCUC	55	GAGCCGUU CUGAUGAG X CGAA AUGAAGAA	1830
974	CAACGGCU C CAACUGGG	56	CCCAGUUG CUGAUGAG X CGAA AGCCGUUG	1831
990	GAAGGCAU C CUGGGGCU	57	AGCCCCAG CUGAUGAG X CGAA AUGCCUUC	1832
1004	GCUGGCCU A UGCUGAGA	58	UCUCAGCA CUGAUGAG X CGAA AGGCCAGC	1833
1014	GCUGAGAU U GCCAGGCC	59	GGCCUGGC CUGAUGAG X CGAA AUCUCAGC	1834
1031	UGACGACU C CCUGGAGC	60	GCUCCAGG CUGAUGAG X CGAA AGUCGUCA	1835
1042	UGGAGCCU U UCUUUGAC	61	GUCAAAGA CUGAUGAG X CGAA AGGCUCCA	1836
1043	GGAGCCUU U CUUUGACU	62	AGUCAAAG CUGAUGAG X CGAA AAGGCUCC	1837
1044	GAGCCUUU C UUUGACUC	63	GAGUCAAA CUGAUGAG X CGAA AAAGGCUC	1838
1046	GCCUUUCU U UGACUCUC	64	GAGAGUCA CUGAUGAG X CGAA AGAAAGGC	1839
1047	CCUUUCUU U GACUCUCU	65	AGAGAGUC CUGAUGAG X CGAA AAGAAAGG	1840
1052	CUUUGACU C UCUGGUAA	66	UUACCAGA CUGAUGAG X CGAA AGUCAAAG	1841
1054	UUGACUCU C UGGUAAAG	67	CUUUACCA CUGAUGAG X CGAA AGAGUCAA	1842
1059	UCUCUGGU A AAGCAGAC	68	GUCUGCUU CUGAUGAG X CGAA ACCAGAGA	1843
1074	ACCCACGU U CCCAACCU	69	AGGUUGGG CUGAUGAG X CGAA ACGUGGGU	1844
1075	CCCACGUU C CCAACCUC	70	GAGGUUGG CUGAUGAG X CGAA AACGUGGG	1845
1083	CCCAACCU C UUCUCCCU	71	AGGGAGAA CUGAUGAG X CGAA AGGUUGGG	1846
1085	CAACCUCU U CUCCCUGC	72	GCAGGGAG CUGAUGAG X CGAA AGAGGUUG	1847
1086	AACCUCUU C UCCCUGCA	73	UGCAGGGA CUGAUGAG X CGAA AAGAGGUU	1848
1088	CCUCUUCU C CCUGCAGC	74	GCUGCAGG CUGAUGAG X CGAA AGAAGAGG	1849
1098	CUGCAGCU U UGUGGUGC	75	GCACCACA CUGAUGAG X CGAA AGCUGCAG	1850
1099	UGCAGCUU U GUGGUGCU	76	AGCACCAC CUGAUGAG X CGAA AAGCUGCA	1851
1112	UGCUGGCU U CCCCCUCA	77	UGAGGGGG CUGAUGAG X CGAA AGCCAGCA	1852
1113	GCUGGCUU C CCCCUCAA	78	UUGAGGGG CUGAUGAG X CGAA AAGCCAGC	1853
1119	UUCCCCCU C AACCAGUC	79	GACUGGUU CUGAUGAG X CGAA AGGGGGAA	1854
1127	CAACCAGU C UGAAGUGC	80	GCACUUCA CUGAUGAG X CGAA ACUGGUUG	1855
1142	GCUGGCCU C UGUCGGAG	81	CUCCGACA CUGAUGAG X CGAA AGGCCAGC	1856
1146	GCCUCUGU C GGAGGGAG	82	CUCCCUCC CUGAUGAG X CGAA ACAGAGGC	1857
1161	AGCAUGAU C AUUGGAGG	83	CCUCCAAU CUGAUGAG X CGAA AUCAUGCU	1858
1164	AUGAUCAU U GGAGGUAU	84	AUACCUCC CUGAUGAG X CGAA AUGAUCAU	1859
1171	UUGGAGGU A UCGACCAC	85	GUGGUCGA CUGAUGAG X CGAA ACCUCCAA	1860
1173	GGAGGUAU C GACCACUC	86	GAGUGGUC CUGAUGAG X CGAA AUACCUCC	1861
1181	CGACCACU C GCUGUACA	87	UGUACAGC CUGAUGAG X CGAA AGUGGUCG	1862
1187	CUCGCUGU A CACAGGCA	88	UGCCUGUG CUGAUGAG X CGAA ACAGCGAG	1863
1198	CAGGCAGU C UCUGGUAU	89	AUACCAGA CUGAUGAG X CGAA ACUGCCUG	1864
1200	GGCAGUCU C UGGUAUAC	90	GUAUACCA CUGAUGAG X CGAA AGACUGCC	1865
1205	UCUCUGGU A UACACCCA	91	UGGGUGUA CUGAUGAG X CGAA ACCAGAGA	1866
1207	UCUGGUAU A CACCCAUC	92	GAUGGGUG CUGAUGAG X CGAA AUACCAGA	1867
1215	ACACCCAU C CGGCGGGA	93	UCCCGCCG CUGAUGAG X CGAA AUGGGUGU	1868
1229	GGAGUGGU A UUAUGAGG	94	CCUCAUAA CUGAUGAG X CGAA ACCACUCC	1869
1231	AGUGGUAU U AUGAGGUG	95	CACCUCAU CUGAUGAG X CGAA AUACCACU	1870
1232	GUGGUAUU A UGAGGUGA	96	UCACCUCA CUGAUGAG X CGAA AAUACCAC	1871
1242	GAGGUGAU C AUUGUGCG	97	CGCACAAU CUGAUGAG X CGAA AUCACCUC	1872
1245	GUGAUCAU U GUGCGGGU	98	ACCCGCAC CUGAUGAG X CGAA AUGAUCAC	1873

Table 18

1260	GUGGAGAU C AAUGGACA	99	UGUCCAUU CUGAUGAG X CGAA AUCUCCAC	1874
1273	GACAGGAU C UGAAAAUG	100	CAUUUUCA CUGAUGAG X CGAA AUCCUGUC	1875
1295	CAAGGAGU A CAACUAUG	101	CAUAGUUG CUGAUGAG X CGAA ACUCCUUG	1876
1301	GUACAACU A UGACAAGA	102	UCUUGUCA CUGAUGAG X CGAA AGUUGUAC	1877
1314	AAGAGCAU U GUGGACAG	103	CUGUCCAC CUGAUGAG X CGAA AUGCUCUU	1878
1338	ACCAACCU U CGUUUGCC	104	GGCAAACG CUGAUGAG X CGAA AGGUUGGU	1879
1339	CCAACCUU C GUUUGCCC	105	GGGCAAAC CUGAUGAG X CGAA AAGGUUGG	1880
1342	ACCUUCGU U UGCCCAAG	106	CUUGGGCA CUGAUGAG X CGAA ACGAAGGU	1881
1343	CCUUCGUU U GCCCAAGA	107	UCUUGGGC CUGAUGAG X CGAA AACGAAGG	1882
1358	GAAAGUGU U UGAAGCUG	108	CAGCUUCA CUGAUGAG X CGAA ACACUUUC	1883
1359	AAAGUGUU U GAAGCUGC	109	GCAGCUUC CUGAUGAG X CGAA AACACUUU	1884
1371	GCUGCAGU C AAAUCCAU	110	AUGGAUUU CUGAUGAG X CGAA ACUGCAGC	1885
1376	AGUCAAAU C CAUCAAGG	111	CCUUGAUG CUGAUGAG X CGAA AUUUGACU	1886
1380	AAAUCCAU C AAGGCAGC	112	GCUGCCUU CUGAUGAG X CGAA AUGGAUUU	1887
1391	GGCAGCCU C CUCCACGG	113	CCGUGGAG CUGAUGAG X CGAA AGGCUGCC	1888
1394	AGCCUCCU C CACGGAGA	114	UCUCCGUG CUGAUGAG X CGAA AGGAGGCU	1889
1406	GGAGAAGU U CCCUGAUG	115	CAUCAGGG CUGAUGAG X CGAA ACUUCUCC	1890
1407	GAGAAGUU C CCUGAUGG	116	CCAUCAGG CUGAUGAG X CGAA AACUUCUC	1891
1417	CUGAUGGU U UCUGGCUA	117	UAGCCAGA CUGAUGAG X CGAA ACCAUCAG	1892
1418	UGAUGGUU U CUGGCUAG	118	CUAGCCAG CUGAUGAG X CGAA AACCAUCA	1893
1419	GAUGGUUU C UGGCUAGG	119	CCUAGCCA CUGAUGAG X CGAA AAACCAUC	1894
1425	UUCUGGCU A GGAGAGCA	120	UGCUCUCC CUGAUGAG X CGAA AGCCAGAA	1895
1465	CCACCCCU U GGAACAUU	121	AAUGUUCC CUGAUGAG X CGAA AGGGGUGG	1896
1473	UGGAACAU U UUCCCAGU	122	ACUGGGAA CUGAUGAG X CGAA AUGUUCCA	1897
1474	GGAACAUU U UCCCAGUC	123	GACUGGGA CUGAUGAG X CGAA AAUGUUCC	1898
1475	GAACAUUU U CCCAGUCA	124	UGACUGGG CUGAUGAG X CGAA AAAUGUUC	1899
1476	AACAUUUU C CCAGUCAU	125	AUGACUGG CUGAUGAG X CGAA AAAAUGUU	1900
1482	UUCCCAGU C AUCUCACU	126	AGUGAGAU CUGAUGAG X CGAA ACUGGGAA	1901
1485	CCAGUCAU C UCACUCUA	127	UAGAGUGA CUGAUGAG X CGAA AUGACUGG	1902
1487	AGUCAUCU C ACUCUACC	128	GGUAGAGU CUGAUGAG X CGAA AGAUGACU	1903
1491	AUCUCACU C UACCUAAU	129	AUUAGGUA CUGAUGAG X CGAA AGUGAGAU	1904
1493	CUCACUCU A CCUAAUGG	130	CCAUUAGG CUGAUGAG X CGAA AGAGUGAG	1905
1497	CUCUACCU A AUGGGUGA	131	UCACCCAU CUGAUGAG X CGAA AGGUAGAG	1906
1509	GGUGAGGU U ACCAACCA	132	UGGUUGGU CUGAUGAG X CGAA ACCUCACC	1907
1510	GUGAGGUU A CCAACCAG	133	CUGGUUGG CUGAUGAG X CGAA AACCUCAC	1908
1520	CAACCAGU C CUUCCGCA	134	UGCGGAAG CUGAUGAG X CGAA ACUGGUUG	1909
1523	CCAGUCCU U CCGCAUCA	135	UGAUGCGG CUGAUGAG X CGAA AGGACUGG	1910
1524	CAGUCCUU C CGCAUCAC	136	GUGAUGCG CUGAUGAG X CGAA AAGGACUG	1911
1530	UUCCGCAU C ACCAUCCU	137	AGGAUGGU CUGAUGAG X CGAA AUGCGGAA	1912
1536	AUCACCAU C CUUCCGCA	138	UGCGGAAG CUGAUGAG X CGAA AUGGUGAU	1913
1539	ACCAUCCU U CCGCAGCA	139	UGCUGCGG CUGAUGAG X CGAA AGGAUGGU	1914
1540	CCAUCCUU C CGCAGCAA	140	UUGCUGCG CUGAUGAG X CGAA AAGGAUGG	1915
1550	GCAGCAAU A CCUGCGGC	141	GCCGCAGG CUGAUGAG X CGAA AUUGCUGC	1916
1580	GGCCACGU C CCAAGACG	142	CGUCUUGG CUGAUGAG X CGAA ACGUGGCC	1917
1594	ACGACUGU U ACAAGUUU	143	AAACUUGU CUGAUGAG X CGAA ACAGUCGU	1918
1595	CGACUGUU A CAAGUUUG	144	CAAACUUG CUGAUGAG X CGAA AACAGUCG	1919
1601	UUACAAGU U UGCCAUCU	145	AGAUGGCA CUGAUGAG X CGAA ACUUGUAA	1920
1602	UACAAGUU U GCCAUCUC	146	GAGAUGGC CUGAUGAG X CGAA AACUUGUA	1921
1608	UUUGCCAU C UCACAGUC	147	GACUGUGA CUGAUGAG X CGAA AUGGCAAA	1922
1610	UGCCAUCU C ACAGUCAU	148	AUGACUGU CUGAUGAG X CGAA AGAUGGCA	1923
1616	CUCACAGU C AUCCACGG	149	CCGUGGAU CUGAUGAG X CGAA ACUGUGAG	1924

Table 18

1619	ACAGUCAU C CACGGGCA	150	UGCCCGUG CUGAUGAG X CGAA AUGACUGU	1925
1632	GGCACUGU U AUGGGAGC	151	GCUCCCAU CUGAUGAG X CGAA ACAGUGCC	1926
1633	GCACUGUU A UGGGAGCU	152	AGCUCCCA CUGAUGAG X CGAA AACAGUGC	1927
1644	GGAGCUGU U AUCAUGGA	153	UCCAUGAU CUGAUGAG X CGAA ACAGCUCC	1928
1645	GAGCUGUU A UCAUGGAG	154	CUCCAUGA CUGAUGAG X CGAA AACAGCUC	1929
1647	GCUGUUAU C AUGGAGGG	155	CCCUCCAU CUGAUGAG X CGAA AUAACAGC	1930
1658	GGAGGGCU U CUACGUUG	156	CAACGUAG CUGAUGAG X CGAA AGCCCUCC	1931
1659	GAGGGCUU C UACGUUGU	157	ACAACGUA CUGAUGAG X CGAA AAGCCCUC	1932
1661	GGGCUUCU A CGUUGUCU	158	AGACAACG CUGAUGAG X CGAA AGAAGCCC	1933
1665	UUCUACGU U GUCUUUGA	159	UCAAAGAC CUGAUGAG X CGAA ACGUAGAA	1934
1668	UACGUUGU C UUUGAUCG	160	CGAUCAAA CUGAUGAG X CGAA ACAACGUA	1935
1670	CGUUGUCU U UGAUCGGG	161	CCCGAUCA CUGAUGAG X CGAA AGACAACG	1936
1671	GUUGUCUU U GAUCGGGC	162	GCCCGAUC CUGAUGAG X CGAA AAGACAAC	1937
1675	UCUUUGAU C GGGCCCGA	163	UCGGGCCC CUGAUGAG X CGAA AUCAAAGA	1938
1692	AAACGAAU U GGCUUUGC	164	GCAAAGCC CUGAUGAG X CGAA AUUCGUUU	1939
1697	AAUUGGCU U UGCUGUCA	165	UGACAGCA CUGAUGAG X CGAA AGCCAAUU	1940
1698	AUUGGCUU U GCUGUCAG	166	CUGACAGC CUGAUGAG X CGAA AAGCCAAU	1941
1704	UUUGCUGU C AGCGCUUG	167	CAAGCGCU CUGAUGAG X CGAA ACAGCAAA	1942
1711	UCAGCGCU U GCCAUGUG	168	CACAUGGC CUGAUGAG X CGAA AGCGCUGA	1943
1730	CGAUGAGU U CAGGACGG	169	CCGUCCUG CUGAUGAG X CGAA ACUCAUCG	1944
1731	GAUGAGUU C AGGACGGC	170	GCCGUCCU CUGAUGAG X CGAA AACUCAUC	1945
1756	AAGGCCCU U UUGUCACC	171	GGUGACAA CUGAUGAG X CGAA AGGGCCUU	1946
1757	AGGCCCUU U UGUCACCU	172	AGGUGACA CUGAUGAG X CGAA AAGGGCCU	1947
1758	GGCCCUUU U GUCACCUU	173	AAGGUGAC CUGAUGAG X CGAA AAAGGGCC	1948
1761	CCUUUUGU C ACCUUGGA	174	UCCAAGGU CUGAUGAG X CGAA ACAAAAGG	1949
1766	UGUCACCU U GGACAUGG	175	CCAUGUCC CUGAUGAG X CGAA AGGUGACA	1950
1787	CUGUGGCU A CAACAUUC	176	GAAUGUUG CUGAUGAG X CGAA AGCCACAG	1951
1794	UACAACAU U CCACAGAC	177	GUCUGUGG CUGAUGAG X CGAA AUGUUGUA	1952
1795	ACAACAUU C CACAGACA	178	UGUCUGUG CUGAUGAG X CGAA AAUGUUGU	1953
1811	AGAUGAGU C AACCCUCA	179	UGAGGGUU CUGAUGAG X CGAA ACUCAUCU	1954
1818	UCAACCCU C AUGACCAU	180	AUGGUCAU CUGAUGAG X CGAA AGGGUUGA	1955
1827	AUGACCAU A GCCUAUGU	181	ACAUAGGC CUGAUGAG X CGAA AUGGUCAU	1956
1832	CAUAGCCU A UGUCAUGG	182	CCAUGACA CUGAUGAG X CGAA AGGCUAUG	1957
1836	GCCUAUGU C AUGGCUGC	183	GCAGCCAU CUGAUGAG X CGAA ACAUAGGC	1958
1848	GCUGCCAU C UGCGCCCU	184	AGGGCGCA CUGAUGAG X CGAA AUGGCAGC	1959
1857	UGCGCCCU C UUCAUGCU	185	AGCAUGAA CUGAUGAG X CGAA AGGGCGCA	1960
1859	CGCCCUCU U CAUGCUGC	186	GCAGCAUG CUGAUGAG X CGAA AGAGGGCG	1961
1860	GCCCUCUU C AUGCUGCC	187	GGCAGCAU CUGAUGAG X CGAA AAGAGGGC	1962
1872	CUGCCACU C UGCCUCAU	188	AUGAGGCA CUGAUGAG X CGAA AGUGGCAG	1963
1878	CUCUGCCU C AUGGUGUG	189	CACACCAU CUGAUGAG X CGAA AGGCAGAG	1964
1888	UGGUGUGU C AGUGGCGC	190	GCGCCACU CUGAUGAG X CGAA ACACACCA	1965
1902	CGCUGCCU C CGCUGCCU	191	AGGCAGCG CUGAUGAG X CGAA AGGCAGCG	1966
1931	UGAUGACU U UGCUGAUG	192	CAUCAGCA CUGAUGAG X CGAA AGUCAUCA	1967
1932	GAUGACUU U GCUGAUGA	193	UCAUCAGC CUGAUGAG X CGAA AAGUCAUC	1968
1944	GAUGACAU C UCCCUGCU	194	AGCAGGGA CUGAUGAG X CGAA AUGUCAUC	1969
1946	UGACAUCU C CCUGCUGA	195	UCAGCAGG CUGAUGAG X CGAA AGAUGUCA	1970
1981	CAGAAGAU A GAGAUUCC	196	GGAAUCUC CUGAUGAG X CGAA AUCUUCUG	1971
1987	AUAGAGAU U CCCCUGGA	197	UCCAGGGG CUGAUGAG X CGAA AUCUCUAU	1972
1988	UAGAGAUU C CCCUGGAC	198	GUCCAGGG CUGAUGAG X CGAA AAUCUCUA	1973
2004	CCACACCU C CGUGGUUC	199	GAACCACG CUGAUGAG X CGAA AGGUGUGG	1974
2011	UCCGUGGU U CACUUUGG	200	CCAAAGUG CUGAUGAG X CGAA ACCACGGA	1975

Table 18

2012	CCGUGGUU C ACUUUGGU	201	ACCAAAGU CUGAUGAG X CGAA AACCACGG	1976
2016	GGUUCACU U UGGUCACA	202	UGUGACCA CUGAUGAG X CGAA AGUGAACC	1977
2017	GUUCACUU U GGUCACAA	203	UUGUGACC CUGAUGAG X CGAA AAGUGAAC	1978
2021	ACUUUGGU C ACAAGUAG	204	CUACUUGU CUGAUGAG X CGAA ACCAAAGU	1979
2028	UCACAAGU A GGAGACAC	205	GUGUCUCC CUGAUGAG X CGAA ACUUGUGA	1980
2063	GAGCACCU C AGGACCCU	206	AGGGUCCU CUGAUGAG X CGAA AGGUGCUC	1981
2072	AGGACCCU C CCCACCCA	207	UGGGUGGG CUGAUGAG X CGAA AGGGUCCU	1982
2091	AAAUGCCU C UGCCUUGA	208	UCAAGGCA CUGAUGAG X CGAA AGGCAUUU	1983
2097	CUCUGCCU U GAUGGAGA	209	UCUCCAUC CUGAUGAG X CGAA AGGCAGAG	1984
2129	AGGUGGGU U CCAGGGAC	210	GUCCCUGG CUGAUGAG X CGAA ACCCACCU	1985
2130	GGUGGGUU C CAGGGACU	211	AGUCCCUG CUGAUGAG X CGAA AACCCACC	1986
2141	GGGACUGU A CCUGUAGG	212	CCUACAGG CUGAUGAG X CGAA ACAGUCCC	1987
2147	GUACCUGU A GGAAACAG	213	CUGUUUCC CUGAUGAG X CGAA ACAGGUAC	1988
2177	GAAGCACU C UGCUGGCG	214	CGCCAGCA CUGAUGAG X CGAA AGUGCUUC	1989
2191	GCGGGAAU A CUCUUGGU	215	ACCAAGAG CUGAUGAG X CGAA AUUCCCGC	1990
2194	GGAAUACU C UUGGUCAC	216	GUGACCAA CUGAUGAG X CGAA AGUAUUCC	1991
2196	AAUACUCU U GGUCACCU	217	AGGUGACC CUGAUGAG X CGAA AGAGUAUU	1992
2200	CUCUUGGU C ACCUCAAA	218	UUUGAGGU CUGAUGAG X CGAA ACCAAGAG	1993
2205	GGUCACCU C AAAUUUAA	219	UUAAAUUU CUGAUGAG X CGAA AGGUGACC	1994
2210	CCUCAAAU U UAAGUCGG	220	CCGACUUA CUGAUGAG X CGAA AUUUGAGG	1995
2211	CUCAAAUU U AAGUCGGG	221	CCCGACUU CUGAUGAG X CGAA AAUUUGAG	1996
2212	UCAAAUUU A AGUCGGGA	222	UCCCGACU CUGAUGAG X CGAA AAAUUUGA	1997
2216	AUUUAAGU C GGGAAAUU	223	AAUUUCCC CUGAUGAG X CGAA ACUUAAAU	1998
2224	CGGGAAAU U CUGCUGCU	224	AGCAGCAG CUGAUGAG X CGAA AUUUCCCG	1999
2225	GGGAAAUU C UGCUGCUU	225	AAGCAGCA CUGAUGAG X CGAA AAUUUCCC	2000
2233	CUGCUGCU U GAAACUUC	226	GAAGUUUC CUGAUGAG X CGAA AGCAGCAG	2001
2240	UUGAAACU U CAGCCCUG	227	CAGGGCUG CUGAUGAG X CGAA AGUUUCAA	2002
2241	UGAAACUU C AGCCCUGA	228	UCAGGGCU CUGAUGAG X CGAA AAGUUUCA	2003
2254	CUGAACCU U UGUCCACC	229	GGUGGACA CUGAUGAG X CGAA AGGUUCAG	2004
2255	UGAACCUU U GUCCACCA	230	UGGUGGAC CUGAUGAG X CGAA AAGGUUCA	2005
2258	ACCUUUGU C CACCAUUC	231	GAAUGGUG CUGAUGAG X CGAA ACAAAGGU	2006
2265	UCCACCAU U CCUUUAAA	232	UUUAAAGG CUGAUGAG X CGAA AUGGUGGA	2007
2266	CCACCAUU C CUUUAAAU	233	AUUUAAAG CUGAUGAG X CGAA AAUGGUGG	2008
2269	CCAUUCCU U UAAAUUCU	234	AGAAUUUA CUGAUGAG X CGAA AGGAAUGG	2009
2270	CAUUCCUU U AAAUUCUC	235	GAGAAUUU CUGAUGAG X CGAA AAGGAAUG	2010
2271	AUUCCUUU A AAUUCUCC	236	GGAGAAUU CUGAUGAG X CGAA AAAGGAAU	2011
2275	CUUUAAAU U CUCCAACC	237	GGUUGGAG CUGAUGAG X CGAA AUUUAAAG	2012
2276	UUUAAAUU C UCCAACCC	238	GGGUUGGA CUGAUGAG X CGAA AAUUUAAA	2013
2278	UAAAUUCU C CAACCCAA	239	UUGGGUUG CUGAUGAG X CGAA AGAAUUUA	2014
2290	CCCAAAGU A UUCUUCUU	240	AAGAAGAA CUGAUGAG X CGAA ACUUUGGG	2015
2292	CAAAGUAU U CUUCUUUU	241	AAAAGAAG CUGAUGAG X CGAA AUACUUUG	2016
2293	AAAGUAUU C UUCUUUUC	242	GAAAAGAA CUGAUGAG X CGAA AAUACUUU	2017
2295	AGUAUUCU U CUUUUCUU	243	AAGAAAAG CUGAUGAG X CGAA AGAAUACU	2018
2296	GUAUUCUU C UUUUCUUA	244	UAAGAAAA CUGAUGAG X CGAA AAGAAUAC	2019
2298	AUUCUUCU U UUCUUAGU	245	ACUAAGAA CUGAUGAG X CGAA AGAAGAAU	2020
2299	UUCUUCUU U UCUUAGUU	246	AACUAAGA CUGAUGAG X CGAA AAGAAGAA	2021
2300	UCUUCUUU U CUUAGUUU	247	AAACUAAG CUGAUGAG X CGAA AAAGAAGA	2022
2301	CUUCUUUU C UUAGUUUC	248	GAAACUAA CUGAUGAG X CGAA AAAAGAAG	2023
2303	UCUUUUCU U AGUUUCAG	249	CUGAAACU CUGAUGAG X CGAA AGAAAAGA	2024
2304	CUUUUCUU A GUUUCAGA	250	UCUGAAAC CUGAUGAG X CGAA AAGAAAAG	2025
2307	UUCUUAGU U UCAGAAGU	251	ACUUCUGA CUGAUGAG X CGAA ACUAAGAA	2026

Table 18

2308	UCUUAGUU U CAGAAGUA	252	UACUUCUG CUGAUGAG X CGAA AACUAAGA	2027
2309	CUUAGUUU C AGAAGUAC	253	GUACUUCU CUGAUGAG X CGAA AAACUAAG	2028
2316	UCAGAAGU A CUGGCAUC	254	GAUGCCAG CUGAUGAG X CGAA ACUUCUGA	2029
2324	ACUGGCAU C ACACGCAG	255	CUGCGUGU CUGAUGAG X CGAA AUGCCAGU	2030
2335	ACGCAGGU U ACCUUGGC	256	GCCAAGGU CUGAUGAG X CGAA ACCUGCGU	2031
2336	CGCAGGUU A CCUUGGCG	257	CGCCAAGG CUGAUGAG X CGAA AACCUGCG	2032
2340	GGUUACCU U GGCGUGUG	258	CACACGCC CUGAUGAG X CGAA AGGUAACC	2033
2350	GCGUGUGU C CCUGUGGU	259	ACCACAGG CUGAUGAG X CGAA ACACACGC	2034
2359	CCUGUGGU A CCCUGGCA	260	UGCCAGGG CUGAUGAG X CGAA ACCACAGG	2035
2384	ACCAAGCU U GUUUCCCU	261	AGGGAAAC CUGAUGAG X CGAA AGCUUGGU	2036
2387	AAGCUUGU U UCCCUGCU	262	AGCAGGGA CUGAUGAG X CGAA ACAAGCUU	2037
2388	AGCUUGUU U CCCUGCUG	263	CAGCAGGG CUGAUGAG X CGAA AACAAGCU	2038
2389	GCUUGUUU C CCUGCUGG	264	CCAGCAGG CUGAUGAG X CGAA AAACAAGC	2039
2405	GCCAAAGU C AGUAGGAG	265	CUCCUACU CUGAUGAG X CGAA ACUUUGGC	2040
2409	AAGUCAGU A GGAGAGGA	266	UCCUCUCC CUGAUGAG X CGAA ACUGACUU	2041
2426	UGCACAGU U UGCUAUUU	267	AAAUAGCA CUGAUGAG X CGAA ACUGUGCA	2042
2427	GCACAGUU U GCUAUUUG	268	CAAAUAGC CUGAUGAG X CGAA AACUGUGC	2043
2431	AGUUUGCU A UUUGCUUU	269	AAAGCAAA CUGAUGAG X CGAA AGCAAACU	2044
2433	UUUGCUAU U UGCUUUAG	270	CUAAAGCA CUGAUGAG X CGAA AUAGCAAA	2045
2434	UUGCUAUU U GCUUUAGA	271	UCUAAAGC CUGAUGAG X CGAA AAUAGCAA	2046
2438	UAUUUGCU U UAGAGACA	272	UGUCUCUA CUGAUGAG X CGAA AGCAAAUA	2047
2439	AUUUGCUU U AGAGACAG	273	CUGUCUCU CUGAUGAG X CGAA AAGCAAAU	2048
2440	UUUGCUUU A GAGACAGG	274	CCUGUCUC CUGAUGAG X CGAA AAAGCAAA	2049
2455	GGGACUGU A UAAACAAG	275	CUUGUUUA CUGAUGAG X CGAA ACAGUCCC	2050
2457	GACUGUAU A AACAAGCC	276	GGCUUGUU CUGAUGAG X CGAA AUACAGUC	2051
2467	ACAAGCCU A ACAUUGGU	277	ACCAAUGU CUGAUGAG X CGAA AGGCUUGU	2052
2472	CCUAACAU U GGUGCAAA	278	UUUGCACC CUGAUGAG X CGAA AUGUUAGG	2053
2484	GCAAAGAU U GCCUCUUG	279	CAAGAGGC CUGAUGAG X CGAA AUCUUUGC	2054
2489	GAUUGCCU C UUGAAUUA	280	UAAUUCAA CUGAUGAG X CGAA AGGCAAUC	2055
2491	UUGCCUCU U GAAUUAAA	281	UUUAAUUC CUGAUGAG X CGAA AGAGGCAA	2056
2496	UCUUGAAU U AAAAAAAA	282	UUUUUUUU CUGAUGAG X CGAA AUUCAAGA	2057
2497	CUUGAAUU A AAAAAAAA	283	UUUUUUUU CUGAUGAG X CGAA AAUUCAAG	2058
2510	AAAAAACU A GAAAAAAA	284	UUUUUUUC CUGAUGAG X CGAA AGUUUUUU	2059

Input Sequence = AF190725. Cut Site = G/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
AF190725 (Homo sapiens beta-site APP cleaving enzyme (BACE) mRNA; 2526 bp)

Table 19

Table 19: Human BACE NCH Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
10	CACGCGUC C GCAGCCCG	285	CGGGCUGC CUGAUGAG X CGAA IACGCGUG	2060
13	GCGUCCGC A GCCCGCCC	286	GGGCGGGC CUGAUGAG X CGAA ICGGACGC	2061
16	UCCGCAGC C CGCCCGGG	287	CCCGGGCG CUGAUGAG X CGAA ICUGCGGA	2062
17	CCGCAGCC C GCCCGGGA	288	UCCCGGGC CUGAUGAG X CGAA IGCUGCGG	2063
20	CAGCCCGC C CGGGAGCU	289	AGCUCCCG CUGAUGAG X CGAA ICGGGCUG	2064
21	AGCCCGCC C GGGAGCUG	290	CAGCUCCC CUGAUGAG X CGAA IGCGGGCU	2065
28	CCGGGAGC U GCGAGCCG	291	CGGCUCGC CUGAUGAG X CGAA ICUCCCGG	2066
35	CUGCGAGC C GCGAGCUG	292	CAGCUCGC CUGAUGAG X CGAA ICUCGCAG	2067
42	CCGCGAGC U GGAUUAUG	293	CAUAAUCC CUGAUGAG X CGAA ICUCGCGG	2068
56	AUGGUGGC C UGAGCAGC	294	GCUGCUCA CUGAUGAG X CGAA ICCACCAU	2069
57	UGGUGGCC U GAGCAGCC	295	GGCUGCUC CUGAUGAG X CGAA IGCCACCA	2070
62	GCCUGAGC A GCCAACGC	296	GCGUUGGC CUGAUGAG X CGAA ICUCAGGC	2071
65	UGAGCAGC C AACGCAGC	297	GCUGCGUU CUGAUGAG X CGAA ICUGCUCA	2072
66	GAGCAGCC A ACGCAGCC	298	GGCUGCGU CUGAUGAG X CGAA IGCUGCUC	2073
71	GCCAACGC A GCCGCAGG	299	CCUGCGGC CUGAUGAG X CGAA ICGUUGGC	2074
74	AACGCAGC C GCAGGAGC	300	GCUCCUGC CUGAUGAG X CGAA ICUGCGUU	2075
77	GCAGCCGC A GGAGCCCG	301	CGGGCUCC CUGAUGAG X CGAA ICGGCUGC	2076
83	GCAGGAGC C CGGAGCCC	302	GGGCUCCG CUGAUGAG X CGAA ICUCCUGC	2077
84	CAGGAGCC C GGAGCCCU	303	AGGGCUCC CUGAUGAG X CGAA IGCUCCUG	2078
90	CCCGGAGC C CUUGCCCC	304	GGGGCAAG CUGAUGAG X CGAA ICUCCGGG	2079
91	CCGGAGCC C UUGCCCCU	305	AGGGGCAA CUGAUGAG X CGAA IGCUCCGG	2080
92	CGGAGCCC U UGCCCCUG	306	CAGGGGCA CUGAUGAG X CGAA IGGCUCCG	2081
96	GCCCUUGC C CCUGCCCG	307	CGGGCAGG CUGAUGAG X CGAA ICAAGGGC	2082
97	CCCUUGCC C CUGCCCGC	308	GCGGGCAG CUGAUGAG X CGAA IGCAAGGG	2083
98	CCUUGCCC C UGCCCGCG	309	CGCGGGCA CUGAUGAG X CGAA IGGCAAGG	2084
99	CUUGCCCC U GCCCGCGC	310	GCGCGGGC CUGAUGAG X CGAA IGGGCAAG	2085
102	GCCCCUGC C CGCGCCGC	311	GCGGCGCG CUGAUGAG X CGAA ICAGGGGC	2086
103	CCCCUGCC C GCGCCGCC	312	GGCGGCGC CUGAUGAG X CGAA IGCAGGGG	2087
108	GCCCGCGC C GCCGCCCG	313	CGGGCGGC CUGAUGAG X CGAA ICGCGGGC	2088
111	CGCGCCGC C GCCCGCCG	314	CGGCGGGC CUGAUGAG X CGAA ICGGCGCG	2089
114	GCCGCCGC C CGCCGGGG	315	CCCCGGCG CUGAUGAG X CGAA ICGGCGGC	2090
115	CCGCCGCC C GCCGGGGG	316	CCCCCGGC CUGAUGAG X CGAA IGCGGCGG	2091
118	CCGCCCGC C GGGGGGAC	317	GUCCCCCC CUGAUGAG X CGAA ICGGGCGG	2092
127	GGGGGGAC C AGGGAAGC	318	GCUUCCCU CUGAUGAG X CGAA IUCCCCCC	2093
128	GGGGGACC A GGGAAGCC	319	GGCUUCCC CUGAUGAG X CGAA IGUCCCCC	2094
136	AGGGAAGC C GCCACCGG	320	CCGGUGGC CUGAUGAG X CGAA ICUUCCCU	2095
139	GAAGCCGC C ACCGGCCC	321	GGGCCGGU CUGAUGAG X CGAA ICGGCUUC	2096
140	AAGCCGCC A CCGGCCCG	322	CGGGCCGG CUGAUGAG X CGAA IGCGGCUU	2097
142	GCCGCCAC C GGCCCGCC	323	GGCGGGCC CUGAUGAG X CGAA IUGGCGGC	2098
146	CCACCGGC C CGCCAUGC	324	GCAUGGCG CUGAUGAG X CGAA ICCGGUGG	2099
147	CACCGGCC C GCCAUGCC	325	GGCAUGGC CUGAUGAG X CGAA IGCCGGUG	2100
150	CGGCCCGC C AUGCCCGC	326	GCGGGCAU CUGAUGAG X CGAA ICGGGCCG	2101
151	GGCCCGCC A UGCCCGCC	327	GGCGGGCA CUGAUGAG X CGAA IGCGGGCC	2102
155	CGCCAUGC C CGCCCCUC	328	GAGGGGCG CUGAUGAG X CGAA ICAUGGCG	2103
156	GCCAUGCC C GCCCCUCC	329	GGAGGGGC CUGAUGAG X CGAA IGCAUGGC	2104
159	AUGCCCGC C CCUCCCAG	330	CUGGGAGG CUGAUGAG X CGAA ICGGGCAU	2105
160	UGCCCGCC C CUCCCAGC	331	GCUGGGAG CUGAUGAG X CGAA IGCGGGCA	2106

Table 19

161	GCCCGCCC C UCCCAGCC	332	GGCUGGGA CUGAUGAG X CGAA IGGCGGGC	2107
162	CCCGCCCC U CCCAGCCC	333	GGGCUGGG CUGAUGAG X CGAA IGGGCGGG	2108
164	CGCCCCUC C CAGCCCCG	334	CGGGGCUG CUGAUGAG X CGAA IAGGGGCG	2109
165	GCCCCUCC C AGCCCCGC	335	GCGGGGCU CUGAUGAG X CGAA IGAGGGGC	2110
166	CCCCUCCC A GCCCCGCC	336	GGCGGGGC CUGAUGAG X CGAA IGGAGGGG	2111
169	CUCCCAGC C CCGCCGGG	337	CCCGGCGG CUGAUGAG X CGAA ICUGGGAG	2112
170	UCCCAGCC C CGCCGGGA	338	UCCCGGCG CUGAUGAG X CGAA IGCUGGGA	2113
171	CCCAGCCC C GCCGGGAG	339	CUCCCGGC CUGAUGAG X CGAA IGGCUGGG	2114
174	AGCCCCGC C GGGAGCCC	340	GGGCUCCC CUGAUGAG X CGAA ICGGGGCU	2115
181	CCGGGAGC C CGCGCCCG	341	CGGGCGCG CUGAUGAG X CGAA ICUCCCGG	2116
182	CGGGAGCC C GCGCCCGC	342	GCGGGCGC CUGAUGAG X CGAA IGCUCCCG	2117
187	GCCCGCGC C CGCUGCCC	343	GGGCAGCG CUGAUGAG X CGAA ICGCGGGC	2118
188	CCCGCGCC C GCUGCCCA	344	UGGGCAGC CUGAUGAG X CGAA IGCGCGGG	2119
191	GCGCCCGC U GCCCAGGC	345	GCCUGGGC CUGAUGAG X CGAA ICGGGCGC	2120
194	CCCGCUGC C CAGGCUGG	346	CCAGCCUG CUGAUGAG X CGAA ICAGCGGG	2121
195	CCGCUGCC C AGGCUGGC	347	GCCAGCCU CUGAUGAG X CGAA IGCAGCGG	2122
196	CGCUGCCC A GGCUGGCC	348	GGCCAGCC CUGAUGAG X CGAA IGGCAGCG	2123
200	GCCCAGGC U GGCCGCCG	349	CGGCGGCC CUGAUGAG X CGAA ICCUGGGC	2124
204	AGGCUGGC C GCCGCCGU	350	ACGGCGGC CUGAUGAG X CGAA ICCAGCCU	2125
207	CUGGCCGC C GCCGUGCC	351	GGCACGGC CUGAUGAG X CGAA ICGGCCAG	2126
210	GCCGCCGC C GUGCCGAU	352	AUCGGCAC CUGAUGAG X CGAA ICGGCGGC	2127
215	CGCCGUGC C GAUGUAGC	353	GCUACAUC CUGAUGAG X CGAA ICACGGCG	2128
228	UAGCGGGC U CCGGAUCC	354	GGAUCCGG CUGAUGAG X CGAA ICCCGCUA	2129
230	GCGGGCUC C GGAUCCCA	355	UGGGAUCC CUGAUGAG X CGAA IAGCCCGC	2130
236	UCCGGAUC C CAGCCUCU	356	AGAGGCUG CUGAUGAG X CGAA IAUCCGGA	2131
237	CCGGAUCC C AGCCUCUC	357	GAGAGGCU CUGAUGAG X CGAA IGAUCCGG	2132
238	CGGAUCCC A GCCUCUCC	358	GGAGAGGC CUGAUGAG X CGAA IGGAUCCG	2133
241	AUCCCAGC C UCUCCCCU	359	AGGGGAGA CUGAUGAG X CGAA ICUGGGAU	2134
242	UCCCAGCC U CUCCCCUG	360	CAGGGGAG CUGAUGAG X CGAA IGCUGGGA	2135
244	CCAGCCUC U CCCCUGCU	361	AGCAGGGG CUGAUGAG X CGAA IAGGCUGG	2136
246	AGCCUCUC C CCUGCUCC	362	GGAGCAGG CUGAUGAG X CGAA IAGAGGCU	2137
247	GCCUCUCC C CUGCUCCC	363	GGGAGCAG CUGAUGAG X CGAA IGAGAGGC	2138
248	CCUCUCCC C UGCUCCCG	364	CGGGAGCA CUGAUGAG X CGAA IGGAGAGG	2139
249	CUCUCCCC U GCUCCCGU	365	ACGGGAGC CUGAUGAG X CGAA IGGGAGAG	2140
252	UCCCCUGC U CCCGUGCU	366	AGCACGGG CUGAUGAG X CGAA ICAGGGGA	2141
254	CCCUGCUC C CGUGCUCU	367	AGAGCACG CUGAUGAG X CGAA IAGCAGGG	2142
255	CCUGCUCC C GUGCUCUG	368	CAGAGCAC CUGAUGAG X CGAA IGAGCAGG	2143
260	UCCCGUGC U CUGCGGAU	369	AUCCGCAG CUGAUGAG X CGAA ICACGGGA	2144
262	CCGUGCUC U GCGGAUCU	370	AGAUCCGC CUGAUGAG X CGAA IAGCACGG	2145
270	UGCGGAUC U CCCCUGAC	371	GUCAGGGG CUGAUGAG X CGAA IAUCCGCA	2146
272	CGGAUCUC C CCUGACCG	372	CGGUCAGG CUGAUGAG X CGAA IAGAUCCG	2147
273	GGAUCUCC C CUGACCGC	373	GCGGUCAG CUGAUGAG X CGAA IGAGAUCC	2148
274	GAUCUCCC C UGACCGCU	374	AGCGGUCA CUGAUGAG X CGAA IGGAGAUC	2149
275	AUCUCCCC U GACCGCUC	375	GAGCGGUC CUGAUGAG X CGAA IGGGAGAU	2150
279	CCCCUGAC C GCUCUCCA	376	UGGAGAGC CUGAUGAG X CGAA IUCAGGGG	2151
282	CUGACCGC U CUCCACAG	377	CUGUGGAG CUGAUGAG X CGAA ICGGUCAG	2152
284	GACCGCUC U CCACAGCC	378	GGCUGUGG CUGAUGAG X CGAA IAGCGGUC	2153
286	CCGCUCUC C ACAGCCCG	379	CGGGCUGU CUGAUGAG X CGAA IAGAGCGG	2154
287	CGCUCUCC A CAGCCCGG	380	CCGGGCUG CUGAUGAG X CGAA IGAGAGCG	2155
289	CUCUCCAC A GCCCGGAC	381	GUCCGGGC CUGAUGAG X CGAA IUGGAGAG	2156
292	UCCACAGC C CGGACCCG	382	CGGGUCCG CUGAUGAG X CGAA ICUGUGGA	2157

Table 19

293	CCACAGCC C GGACCCGG	383	CCGGGUCC CUGAUGAG X CGAA IGCUGUGG	2158
298	GCCCGGAC C CGGGGGCU	384	AGCCCCCG CUGAUGAG X CGAA IUCCGGGC	2159
299	CCCGGACC C GGGGGCUG	385	CAGCCCCC CUGAUGAG X CGAA IGUCCGGG	2160
306	CCGGGGGC U GGCCCAGG	386	CCUGGGCC CUGAUGAG X CGAA ICCCCCGG	2161
310	GGGCUGGC C CAGGGCCC	387	GGGCCCUG CUGAUGAG X CGAA ICCAGCCC	2162
311	GGCUGGCC C AGGGCCCU	388	AGGGCCCU CUGAUGAG X CGAA IGCCAGCC	2163
312	GCUGGCCC A GGGCCCUG	389	CAGGGCCC CUGAUGAG X CGAA IGGCCAGC	2164
317	CCCAGGGC C CUGCAGGC	390	GCCUGCAG CUGAUGAG X CGAA ICCCUGGG	2165
318	CCAGGGCC C UGCAGGCC	391	GGCCUGCA CUGAUGAG X CGAA IGCCCUGG	2166
319	CAGGGCCC U GCAGGCCC	392	GGGCCUGC CUGAUGAG X CGAA IGGCCCUG	2167
322	GGCCCUGC A GGCCCUGG	393	CCAGGGCC CUGAUGAG X CGAA ICAGGGCC	2168
326	CUGCAGGC C CUGGCGUC	394	GACGCCAG CUGAUGAG X CGAA ICCUGCAG	2169
327	UGCAGGCC C UGGCGUCC	395	GGACGCCA CUGAUGAG X CGAA IGCCUGCA	2170
328	GCAGGCCC U GGCGUCCU	396	AGGACGCC CUGAUGAG X CGAA IGGCCUGC	2171
335	CUGGCGUC C UGAUGCCC	397	GGGCAUCA CUGAUGAG X CGAA IACGCCAG	2172
336	UGGCGUCC U GAUGCCCC	398	GGGGCAUC CUGAUGAG X CGAA IGACGCCA	2173
342	CCUGAUGC C CCCAAGCU	399	AGCUUGGG CUGAUGAG X CGAA ICAUCAGG	2174
343	CUGAUGCC C CCAAGCUC	400	GAGCUUGG CUGAUGAG X CGAA IGCAUCAG	2175
344	UGAUGCCC C CAAGCUCC	401	GGAGCUUG CUGAUGAG X CGAA IGGCAUCA	2176
345	GAUGCCCC C AAGCUCCC	402	GGGAGCUU CUGAUGAG X CGAA IGGGCAUC	2177
346	AUGCCCCC A AGCUCCCU	403	AGGGAGCU CUGAUGAG X CGAA IGGGGCAU	2178
350	CCCCAAGC U CCCUCUCC	404	GGAGAGGG CUGAUGAG X CGAA ICUUGGGG	2179
352	CCAAGCUC C CUCUCCUG	405	CAGGAGAG CUGAUGAG X CGAA IAGCUUGG	2180
353	CAAGCUCC C UCUCCUGA	406	UCAGGAGA CUGAUGAG X CGAA IGAGCUUG	2181
354	AAGCUCCC U CUCCUGAG	407	CUCAGGAG CUGAUGAG X CGAA IGGAGCUU	2182
356	GCUCCCUC U CCUGAGAA	408	UUCUCAGG CUGAUGAG X CGAA IAGGGAGC	2183
358	UCCCUCUC C UGAGAAGC	409	GCUUCUCA CUGAUGAG X CGAA IAGAGGGA	2184
359	CCCUCUCC U GAGAAGCC	410	GGCUUCUC CUGAUGAG X CGAA IGAGAGGG	2185
367	UGAGAAGC C ACCAGCAC	411	GUGCUGGU CUGAUGAG X CGAA ICUUCUCA	2186
368	GAGAAGCC A CCAGCACC	412	GGUGCUGG CUGAUGAG X CGAA IGCUUCUC	2187
370	GAAGCCAC C AGCACCAC	413	GUGGUGCU CUGAUGAG X CGAA IUGGCUUC	2188
371	AAGCCACC A GCACCACC	414	GGUGGUGC CUGAUGAG X CGAA IGUGGCUU	2189
374	CCACCAGC A CCACCCAG	415	CUGGGUGG CUGAUGAG X CGAA ICUGGUGG	2190
376	ACCAGCAC C ACCCAGAC	416	GUCUGGGU CUGAUGAG X CGAA IUGCUGGU	2191
377	CCAGCACC A CCCAGACU	417	AGUCUGGG CUGAUGAG X CGAA IGUGCUGG	2192
379	AGCACCAC C CAGACUUG	418	CAAGUCUG CUGAUGAG X CGAA IUGGUGCU	2193
380	GCACCACC C AGACUUGG	419	CCAAGUCU CUGAUGAG X CGAA IGUGGUGC	2194
381	CACCACCC A GACUUGGG	420	CCCAAGUC CUGAUGAG X CGAA IGGUGGUG	2195
385	ACCCAGAC U UGGGGGCA	421	UGCCCCCA CUGAUGAG X CGAA IUCUGGGU	2196
393	UUGGGGGC A GGCGCCAG	422	CUGGCGCC CUGAUGAG X CGAA ICCCCCAA	2197
399	GCAGGCGC C AGGGACGG	423	CCGUCCCU CUGAUGAG X CGAA ICGCCUGC	2198
400	CAGGCGCC A GGGACGGA	424	UCCGUCCC CUGAUGAG X CGAA IGCGCCUG	2199
416	ACGUGGGC C AGUGCGAG	425	CUCGCACU CUGAUGAG X CGAA ICCCACGU	2200
417	CGUGGGCC A GUGCGAGC	426	GCUCGCAC CUGAUGAG X CGAA IGCCCACG	2201
426	GUGCGAGC C CAGAGGGC	427	GCCCUCUG CUGAUGAG X CGAA ICUCGCAC	2202
427	UGCGAGCC C AGAGGGCC	428	GGCCCUCU CUGAUGAG X CGAA IGCUCGCA	2203
428	GCGAGCCC A GAGGGCCC	429	GGGCCCUC CUGAUGAG X CGAA IGGCUCGC	2204
435	CAGAGGGC C CGAAGGCC	430	GGCCUUCG CUGAUGAG X CGAA ICCCUCUG	2205
436	AGAGGGCC C GAAGGCCG	431	CGGCCUUC CUGAUGAG X CGAA IGCCCUCU	2206
443	CCGAAGGC C GGGGCCCA	432	UGGGCCCC CUGAUGAG X CGAA ICCUUCGG	2207
449	GCCGGGGC C CACCAUGG	433	CCAUGGUG CUGAUGAG X CGAA ICCCCGGC	2208

Table 19

450	CCGGGGCC C ACCAUGGC	434	GCCAUGGU CUGAUGAG X CGAA IGCCCCGG	2209
451	CGGGGCCC A CCAUGGCC	435	GGCCAUGG CUGAUGAG X CGAA IGGCCCCG	2210
453	GGGCCCAC C AUGGCCCA	436	UGGGCCAU CUGAUGAG X CGAA IUGGGCCC	2211
454	GGCCCACC A UGGCCCAA	437	UUGGGCCA CUGAUGAG X CGAA IGUGGGCC	2212
459	ACCAUGGC C CAAGCCCU	438	AGGGCUUG CUGAUGAG X CGAA ICCAUGGU	2213
460	CCAUGGCC C AAGCCCUG	439	CAGGGCUU CUGAUGAG X CGAA IGCCAUGG	2214
461	CAUGGCCC A AGCCCUGC	440	GCAGGGCU CUGAUGAG X CGAA IGGCCAUG	2215
465	GCCCAAGC C CUGCCCUG	441	CAGGGCAG CUGAUGAG X CGAA ICUUGGGC	2216
466	CCCAAGCC C UGCCCUGG	442	CCAGGGCA CUGAUGAG X CGAA IGCUUGGG	2217
467	CCAAGCCC U GCCCUGGC	443	GCCAGGGC CUGAUGAG X CGAA IGGCUUGG	2218
470	AGCCCUGC C CUGGCUCC	444	GGAGCCAG CUGAUGAG X CGAA ICAGGGCU	2219
471	GCCCUGCC C UGGCUCCU	445	AGGAGCCA CUGAUGAG X CGAA IGCAGGGC	2220
472	CCCUGCCC U GGCUCCUG	446	CAGGAGCC CUGAUGAG X CGAA IGGCAGGG	2221
476	GCCCUGGC U CCUGCUGU	447	ACAGCAGG CUGAUGAG X CGAA ICCAGGGC	2222
478	CCUGGCUC C UGCUGUGG	448	CCACAGCA CUGAUGAG X CGAA IAGCCAGG	2223
479	CUGGCUCC U GCUGUGGA	449	UCCACAGC CUGAUGAG X CGAA IGAGCCAG	2224
482	GCUCCUGC U GUGGAUGG	450	CCAUCCAC CUGAUGAG X CGAA ICAGGAGC	2225
503	GGGAGUGC U GCCUGCCC	451	GGGCAGGC CUGAUGAG X CGAA ICACUCCC	2226
506	AGUGCUGC C UGCCCACG	452	CGUGGGCA CUGAUGAG X CGAA ICAGCACU	2227
507	GUGCUGCC U GCCCACGG	453	CCGUGGGC CUGAUGAG X CGAA IGCAGCAC	2228
510	CUGCCUGC C CACGGCAC	454	GUGCCGUG CUGAUGAG X CGAA ICAGGCAG	2229
511	UGCCUGCC C ACGGCACC	455	GGUGCCGU CUGAUGAG X CGAA IGCAGGCA	2230
512	GCCUGCCC A CGGCACCC	456	GGGUGCCG CUGAUGAG X CGAA IGGCAGGC	2231
517	CCCACGGC A CCCAGCAC	457	GUGCUGGG CUGAUGAG X CGAA ICCGUGGG	2232
519	CACGGCAC C CAGCACGG	458	CCGUGCUG CUGAUGAG X CGAA IUGCCGUG	2233
520	ACGGCACC C AGCACGGC	459	GCCGUGCU CUGAUGAG X CGAA IGUGCCGU	2234
521	CGGCACCC A GCACGGCA	460	UGCCGUGC CUGAUGAG X CGAA IGGUGCCG	2235
524	CACCCAGC A CGGCAUCC	461	GGAUGCCG CUGAUGAG X CGAA ICUGGGUG	2236
529	AGCACGGC A UCCGGCUG	462	CAGCCGGA CUGAUGAG X CGAA ICCGUGCU	2237
532	ACGGCAUC C GGCUGCCC	463	GGGCAGCC CUGAUGAG X CGAA IAUGCCGU	2238
536	CAUCCGGC U GCCCCUGC	464	GCAGGGGC CUGAUGAG X CGAA ICCGGAUG	2239
539	CCGGCUGC C CCUGCGCA	465	UGCGCAGG CUGAUGAG X CGAA ICAGCCGG	2240
540	CGGCUGCC C CUGCGCAG	466	CUGCGCAG CUGAUGAG X CGAA IGCAGCCG	2241
541	GGCUGCCC C UGCGCAGC	467	GCUGCGCA CUGAUGAG X CGAA IGGCAGCC	2242
542	GCUGCCCC U GCGCAGCG	468	CGCUGCGC CUGAUGAG X CGAA IGGGCAGC	2243
547	CCCUGCGC A GCGGCCUG	469	CAGGCCGC CUGAUGAG X CGAA ICGCAGGG	2244
553	GCAGCGGC C UGGGGGGC	470	GCCCCCCA CUGAUGAG X CGAA ICCGCUGC	2245
554	CAGCGGCC U GGGGGGCG	471	CGCCCCCC CUGAUGAG X CGAA IGCCGCUG	2246
564	GGGGGCGC C CCCCUGGG	472	CCCAGGGG CUGAUGAG X CGAA ICGCCCCC	2247
565	GGGGCGCC C CCCUGGGG	473	CCCCAGGG CUGAUGAG X CGAA IGCGCCCC	2248
566	GGGCGCCC C CCUGGGGC	474	GCCCCAGG CUGAUGAG X CGAA IGGCGCCC	2249
567	GGCGCCCC C CUGGGGCU	475	AGCCCCAG CUGAUGAG X CGAA IGGGCGCC	2250
568	GCGCCCCC C UGGGGCUG	476	CAGCCCCA CUGAUGAG X CGAA IGGGGCGC	2251
569	CGCCCCCC U GGGGCUGC	477	GCAGCCCC CUGAUGAG X CGAA IGGGGGCG	2252
575	CCUGGGGC U GCGGCUGC	478	GCAGCCGC CUGAUGAG X CGAA ICCCCAGG	2253
581	GCUGCGGC U GCCCCGGG	479	CCCGGGGC CUGAUGAG X CGAA ICCGCAGC	2254
584	GCGGCUGC C CCGGGAGA	480	UCUCCCGG CUGAUGAG X CGAA ICAGCCGC	2255
585	CGGCUGCC C CGGGAGAC	481	GUCUCCCG CUGAUGAG X CGAA IGCAGCCG	2256
586	GGCUGCCC C GGGAGACC	482	GGUCUCCC CUGAUGAG X CGAA IGGCAGCC	2257
594	CGGGAGAC C GACGAAGA	483	UCUUCGUC CUGAUGAG X CGAA IUCUCCCG	2258
605	CGAAGAGC C CGAGGAGC	484	GCUCCUCG CUGAUGAG X CGAA ICUCUUCG	2259

Table 19

606	GAAGAGCC C GAGGAGCC	485	GGCUCCUC CUGAUGAG X CGAA IGCUCUUC	2260
614	CGAGGAGC C CGGCCGGA	486	UCCGGCCG CUGAUGAG X CGAA ICUCCUCG	2261
615	GAGGAGCC C GGCCGGAG	487	CUCCGGCC CUGAUGAG X CGAA IGCUCCUC	2262
619	AGCCCGGC C GGAGGGGC	488	GCCCCUCC CUGAUGAG X CGAA ICCGGGCU	2263
628	GGAGGGGC A GCUUUGUG	489	CACAAAGC CUGAUGAG X CGAA ICCCCUCC	2264
631	GGGGCAGC U UUGUGGAG	490	CUCCACAA CUGAUGAG X CGAA ICUGCCCC	2265
649	UGGUGGAC A ACCUGAGG	491	CCUCAGGU CUGAUGAG X CGAA IUCCACCA	2266
652	UGGACAAC C UGAGGGGC	492	GCCCCUCA CUGAUGAG X CGAA IUUGUCCA	2267
653	GGACAACC U GAGGGGCA	493	UGCCCCUC CUGAUGAG X CGAA IGUUGUCC	2268
661	UGAGGGGC A AGUCGGGG	494	CCCCGACU CUGAUGAG X CGAA ICCCCUCA	2269
671	GUCGGGGC A GGGCUACU	495	AGUAGCCC CUGAUGAG X CGAA ICCCCGAC	2270
676	GGCAGGGC U ACUACGUG	496	CACGUAGU CUGAUGAG X CGAA ICCCUGCC	2271
679	AGGGCUAC U ACGUGGAG	497	CUCCACGU CUGAUGAG X CGAA IUAGCCCU	2272
693	GAGAUGAC C GUGGGCAG	498	CUGCCCAC CUGAUGAG X CGAA IUCAUCUC	2273
700	CCGUGGGC A GCCCCCCG	499	CGGGGGGC CUGAUGAG X CGAA ICCCACGG	2274
703	UGGGCAGC C CCCCGCAG	500	CUGCGGGG CUGAUGAG X CGAA ICUGCCCA	2275
704	GGGCAGCC C CCCGCAGA	501	UCUGCGGG CUGAUGAG X CGAA IGCUGCCC	2276
705	GGCAGCCC C CCGCAGAC	502	GUCUGCGG CUGAUGAG X CGAA IGGCUGCC	2277
706	GCAGCCCC C CGCAGACG	503	CGUCUGCG CUGAUGAG X CGAA IGGGCUGC	2278
707	CAGCCCCC C GCAGACGC	504	GCGUCUGC CUGAUGAG X CGAA IGGGGCUG	2279
710	CCCCCCGC A GACGCUCA	505	UGAGCGUC CUGAUGAG X CGAA ICGGGGGG	2280
716	GCAGACGC U CAACAUCC	506	GGAUGUUG CUGAUGAG X CGAA ICGUCUGC	2281
718	AGACGCUC A ACAUCCUG	507	CAGGAUGU CUGAUGAG X CGAA IAGCGUCU	2282
721	CGCUCAAC A UCCUGGUG	508	CACCAGGA CUGAUGAG X CGAA IUUGAGCG	2283
724	UCAACAUC C UGGUGGAU	509	AUCCACCA CUGAUGAG X CGAA IAUGUUGA	2284
725	CAACAUCC U GGUGGAUA	510	UAUCCACC CUGAUGAG X CGAA IGAUGUUG	2285
735	GUGGAUAC A GGCAGCAG	511	CUGCUGCC CUGAUGAG X CGAA IUAUCCAC	2286
739	AUACAGGC A GCAGUAAC	512	GUUACUGC CUGAUGAG X CGAA ICCUGUAU	2287
742	CAGGCAGC A GUAACUUU	513	AAAGUUAC CUGAUGAG X CGAA ICUGCCUG	2288
748	GCAGUAAC U UUGCAGUG	514	CACUGCAA CUGAUGAG X CGAA IUUACUGC	2289
753	AACUUUGC A GUGGGUGC	515	GCACCCAC CUGAUGAG X CGAA ICAAAGUU	2290
762	GUGGGUGC U GCCCCCCA	516	UGGGGGGC CUGAUGAG X CGAA ICACCCAC	2291
765	GGUGCUGC C CCCCACCC	517	GGGUGGGG CUGAUGAG X CGAA ICAGCACC	2292
766	GUGCUGCC C CCCACCCC	518	GGGGUGGG CUGAUGAG X CGAA IGCAGCAC	2293
767	UGCUGCCC C CCACCCCU	519	AGGGGUGG CUGAUGAG X CGAA IGGCAGCA	2294
768	GCUGCCCC C CACCCCUU	520	AAGGGGUG CUGAUGAG X CGAA IGGGCAGC	2295
769	CUGCCCCC C ACCCCUUC	521	GAAGGGGU CUGAUGAG X CGAA IGGGGCAG	2296
770	UGCCCCCC A CCCCUUCC	522	GGAAGGGG CUGAUGAG X CGAA IGGGGGCA	2297
772	CCCCCCAC C CCUUCCUG	523	CAGGAAGG CUGAUGAG X CGAA IUGGGGGG	2298
773	CCCCCACC C CUUCCUGC	524	GCAGGAAG CUGAUGAG X CGAA IGUGGGGG	2299
774	CCCCACCC C UUCCUGCA	525	UGCAGGAA CUGAUGAG X CGAA IGGUGGGG	2300
775	CCCACCCC U UCCUGCAU	526	AUGCAGGA CUGAUGAG X CGAA IGGGUGGG	2301
778	ACCCCUUC C UGCAUCGC	527	GCGAUGCA CUGAUGAG X CGAA IAAGGGGU	2302
779	CCCCUUCC U GCAUCGCU	528	AGCGAUGC CUGAUGAG X CGAA IGAAGGGG	2303
782	CUUCCUGC A UCGCUACU	529	AGUAGCGA CUGAUGAG X CGAA ICAGGAAG	2304
787	UGCAUCGC U ACUACCAG	530	CUGGUAGU CUGAUGAG X CGAA ICGAUGCA	2305
790	AUCGCUAC U ACCAGAGG	531	CCUCUGGU CUGAUGAG X CGAA IUAGCGAU	2306
793	GCUACUAC C AGAGGCAG	532	CUGCCUCU CUGAUGAG X CGAA IUAGUAGC	2307
794	CUACUACC A GAGGCAGC	533	GCUGCCUC CUGAUGAG X CGAA IGUAGUAG	2308
800	CCAGAGGC A GCUGUCCA	534	UGGACAGC CUGAUGAG X CGAA ICCUCUGG	2309
803	GAGGCAGC U GUCCAGCA	535	UGCUGGAC CUGAUGAG X CGAA ICUGCCUC	2310

Table 19

807	CAGCUGUC C AGCACAUA	536	UAUGUGCU CUGAUGAG X CGAA IACAGCUG	2311
808	AGCUGUCC A GCACAUAC	537	GUAUGUGC CUGAUGAG X CGAA IGACAGCU	2312
811	UGUCCAGC A CAUACCGG	538	CCGGUAUG CUGAUGAG X CGAA ICUGGACA	2313
813	UCCAGCAC A UACCGGGA	539	UCCCGGUA CUGAUGAG X CGAA IUGCUGGA	2314
817	GCACAUAC C GGGACCUC	540	GAGGUCCC CUGAUGAG X CGAA IUAUGUGC	2315
823	ACCGGGAC C UCCGGAAG	541	CUUCCGGA CUGAUGAG X CGAA IUCCCGGU	2316
824	CCGGGACC U CCGGAAGG	542	CCUUCCGG CUGAUGAG X CGAA IGUCCCGG	2317
826	GGGACCUC C GGAAGGGU	543	ACCCUUCC CUGAUGAG X CGAA IAGGUCCC	2318
845	GUAUGUGC C CUACACCC	544	GGGUGUAG CUGAUGAG X CGAA ICACAUAC	2319
846	UAUGUGCC C UACACCCA	545	UGGGUGUA CUGAUGAG X CGAA IGCACAUA	2320
847	AUGUGCCC U ACACCCAG	546	CUGGGUGU CUGAUGAG X CGAA IGGCACAU	2321
850	UGCCCUAC A CCCAGGGC	547	GCCCUGGG CUGAUGAG X CGAA IUAGGGCA	2322
852	CCCUACAC C CAGGGCAA	548	UUGCCCUG CUGAUGAG X CGAA IUGUAGGG	2323
853	CCUACACC C AGGGCAAG	549	CUUGCCCU CUGAUGAG X CGAA IGUGUAGG	2324
854	CUACACCC A GGGCAAGU	550	ACUUGCCC CUGAUGAG X CGAA IGGUGUAG	2325
859	CCCAGGGC A AGUGGGAA	551	UUCCCACU CUGAUGAG X CGAA ICCCUGGG	2326
875	AGGGGAGC U GGGCACCG	552	CGGUGCCC CUGAUGAG X CGAA ICUCCCCU	2327
880	AGCUGGGC A CCGACCUG	553	CAGGUCGG CUGAUGAG X CGAA ICCCAGCU	2328
882	CUGGGCAC C GACCUGGU	554	ACCAGGUC CUGAUGAG X CGAA IUGCCCAG	2329
886	GCACCGAC C UGGUAAGC	555	GCUUACCA CUGAUGAG X CGAA IUCGGUGC	2330
887	CACCGACC U GGUAAGCA	556	UGCUUACC CUGAUGAG X CGAA IGUCGGUG	2331
895	UGGUAAGC A UCCCCCAU	557	AUGGGGGA CUGAUGAG X CGAA ICUUACCA	2332
898	UAAGCAUC C CCCAUGGC	558	GCCAUGGG CUGAUGAG X CGAA IAUGCUUA	2333
899	AAGCAUCC C CCAUGGCC	559	GGCCAUGG CUGAUGAG X CGAA IGAUGCUU	2334
900	AGCAUCCC C CAUGGCCC	560	GGGCCAUG CUGAUGAG X CGAA IGGAUGCU	2335
901	GCAUCCCC C AUGGCCCC	561	GGGGCCAU CUGAUGAG X CGAA IGGGAUGC	2336
902	CAUCCCCC A UGGCCCCA	562	UGGGGCCA CUGAUGAG X CGAA IGGGGAUG	2337
907	CCCAUGGC C CCAACGUC	563	GACGUUGG CUGAUGAG X CGAA ICCAUGGG	2338
908	CCAUGGCC C CAACGUCA	564	UGACGUUG CUGAUGAG X CGAA IGCCAUGG	2339
909	CAUGGCCC C AACGUCAC	565	GUGACGUU CUGAUGAG X CGAA IGGCCAUG	2340
910	AUGGCCCC A ACGUCACU	566	AGUGACGU CUGAUGAG X CGAA IGGGCCAU	2341
916	CCAACGUC A CUGUGCGU	567	ACGCACAG CUGAUGAG X CGAA IACGUUGG	2342
918	AACGUCAC U GUGCGUGC	568	GCACGCAC CUGAUGAG X CGAA IUGACGUU	2343
927	GUGCGUGC C AACAUUGC	569	GCAAUGUU CUGAUGAG X CGAA ICACGCAC	2344
928	UGCGUGCC A ACAUUGCU	570	AGCAAUGU CUGAUGAG X CGAA IGCACGCA	2345
931	GUGCCAAC A UUGCUGCC	571	GGCAGCAA CUGAUGAG X CGAA IUUGGCAC	2346
936	AACAUUGC U GCCAUCAC	572	GUGAUGGC CUGAUGAG X CGAA ICAAUGUU	2347
939	AUUGCUGC C AUCACUGA	573	UCAGUGAU CUGAUGAG X CGAA ICAGCAAU	2348
940	UUGCUGCC A UCACUGAA	574	UUCAGUGA CUGAUGAG X CGAA IGCAGCAA	2349
943	CUGCCAUC A CUGAAUCA	575	UGAUUCAG CUGAUGAG X CGAA IAUGGCAG	2350
945	GCCAUCAC U GAAUCAGA	576	UCUGAUUC CUGAUGAG X CGAA IUGAUGGC	2351
951	ACUGAAUC A GACAAGUU	577	AACUUGUC CUGAUGAG X CGAA IAUUCAGU	2352
955	AAUCAGAC A AGUUCUUC	578	GAAGAACU CUGAUGAG X CGAA IUCUGAUU	2353
961	ACAAGUUC U UCAUCAAC	579	GUUGAUGA CUGAUGAG X CGAA IAACUUGU	2354
964	AGUUCUUC A UCAACGGC	580	GCCGUUGA CUGAUGAG X CGAA IAAGAACU	2355
967	UCUUCAUC A ACGGCUCC	581	GGAGCCGU CUGAUGAG X CGAA IAUGAAGA	2356
973	UCAACGGC U CCAACUGG	582	CCAGUUGG CUGAUGAG X CGAA ICCGUUGA	2357
975	AACGGCUC C AACUGGGA	583	UCCCAGUU CUGAUGAG X CGAA IAGCCGUU	2358
976	ACGGCUCC A ACUGGGAA	584	UUCCCAGU CUGAUGAG X CGAA IGAGCCGU	2359
979	GCUCCAAC U GGGAAGGC	585	GCCUUCCC CUGAUGAG X CGAA IUUGGAGC	2360
988	GGGAAGGC A UCCUGGGG	586	CCCCAGGA CUGAUGAG X CGAA ICCUUCCC	2361

Table 19

991	AAGGCAUC C UGGGGCUG	587	CAGCCCCA CUGAUGAG X CGAA IAUGCCUU	2362
992	AGGCAUCC U GGGGCUGG	588	CCAGCCCC CUGAUGAG X CGAA IGAUGCCU	2363
998	CCUGGGGC U GGCCUAUG	589	CAUAGGCC CUGAUGAG X CGAA ICCCCAGG	2364
1002	GGGCUGGC C UAUGCUGA	590	UCAGCAUA CUGAUGAG X CGAA ICCAGCCC	2365
1003	GGCUGGCC U AUGCUGAG	591	CUCAGCAU CUGAUGAG X CGAA IGCCAGCC	2366
1008	GCCUAUGC U GAGAUUGC	592	GCAAUCUC CUGAUGAG X CGAA ICAUAGGC	2367
1017	GAGAUUGC C AGGCCUGA	593	UCAGGCCU CUGAUGAG X CGAA ICAAUCUC	2368
1018	AGAUUGCC A GGCCUGAC	594	GUCAGGCC CUGAUGAG X CGAA IGCAAUCU	2369
1022	UGCCAGGC C UGACGACU	595	AGUCGUCA CUGAUGAG X CGAA ICCUGGCA	2370
1023	GCCAGGCC U GACGACUC	596	GAGUCGUC CUGAUGAG X CGAA IGCCUGGC	2371
1030	CUGACGAC U CCCUGGAG	597	CUCCAGGG CUGAUGAG X CGAA IUCGUCAG	2372
1032	GACGACUC C CUGGAGCC	598	GGCUCCAG CUGAUGAG X CGAA IAGUCGUC	2373
1033	ACGACUCC C UGGAGCCU	599	AGGCUCCA CUGAUGAG X CGAA IGAGUCGU	2374
1034	CGACUCCC U GGAGCCUU	600	AAGGCUCC CUGAUGAG X CGAA IGGAGUCG	2375
1040	CCUGGAGC C UUUCUUUG	601	CAAAGAAA CUGAUGAG X CGAA ICUCCAGG	2376
1041	CUGGAGCC U UUCUUUGA	602	UCAAAGAA CUGAUGAG X CGAA IGCUCCAG	2377
1045	AGCCUUUC U UUGACUCU	603	AGAGUCAA CUGAUGAG X CGAA IAAAGGCU	2378
1051	UCUUUGAC U CUCUGGUA	604	UACCAGAG CUGAUGAG X CGAA IUCAAAGA	2379
1053	UUUGACUC U CUGGUAAA	605	UUUACCAG CUGAUGAG X CGAA IAGUCAAA	2380
1055	UGACUCUC U GGUAAAGC	606	GCUUUACC CUGAUGAG X CGAA IAGAGUCA	2381
1064	GGUAAAGC A GACCCACG	607	CGUGGGUC CUGAUGAG X CGAA ICUUUACC	2382
1068	AAGCAGAC C CACGUUCC	608	GGAACGUG CUGAUGAG X CGAA IUCUGCUU	2383
1069	AGCAGACC C ACGUUCCC	609	GGGAACGU CUGAUGAG X CGAA IGUCUGCU	2384
1070	GCAGACCC A CGUUCCCA	610	UGGGAACG CUGAUGAG X CGAA IGGUCUGC	2385
1076	CCACGUUC C CAACCUCU	611	AGAGGUUG CUGAUGAG X CGAA IAACGUGG	2386
1077	CACGUUCC C AACCUCUU	612	AAGAGGUU CUGAUGAG X CGAA IGAACGUG	2387
1078	ACGUUCCC A ACCUCUUC	613	GAAGAGGU CUGAUGAG X CGAA IGGAACGU	2388
1081	UUCCCAAC C UCUUCUCC	614	GGAGAAGA CUGAUGAG X CGAA IUUGGGAA	2389
1082	UCCCAACC U CUUCUCCC	615	GGGAGAAG CUGAUGAG X CGAA IGUUGGGA	2390
1084	CCAACCUC U UCUCCCUG	616	CAGGGAGA CUGAUGAG X CGAA IAGGUUGG	2391
1087	ACCUCUUC U CCCUGCAG	617	CUGCAGGG CUGAUGAG X CGAA IAAGAGGU	2392
1089	CUCUUCUC C CUGCAGCU	618	AGCUGCAG CUGAUGAG X CGAA IAGAAGAG	2393
1090	UCUUCUCC C UGCAGCUU	619	AAGCUGCA CUGAUGAG X CGAA IGAGAAGA	2394
1091	CUUCUCCC U GCAGCUUU	620	AAAGCUGC CUGAUGAG X CGAA IGGAGAAG	2395
1094	CUCCCUGC A GCUUUGUG	621	CACAAAGC CUGAUGAG X CGAA ICAGGGAG	2396
1097	CCUGCAGC U UUGUGGUG	622	CACCACAA CUGAUGAG X CGAA ICUGCAGG	2397
1107	UGUGGUGC U GGCUUCCC	623	GGGAAGCC CUGAUGAG X CGAA ICACCACA	2398
1111	GUGCUGGC U UCCCCCUC	624	GAGGGGGA CUGAUGAG X CGAA ICCAGCAC	2399
1114	CUGGCUUC C CCCUCAAC	625	GUUGAGGG CUGAUGAG X CGAA IAAGCCAG	2400
1115	UGGCUUCC C CCUCAACC	626	GGUUGAGG CUGAUGAG X CGAA IGAAGCCA	2401
1116	GGCUUCCC C CUCAACCA	627	UGGUUGAG CUGAUGAG X CGAA IGGAAGCC	2402
1117	GCUUCCCC C UCAACCAG	628	CUGGUUGA CUGAUGAG X CGAA IGGGAAGC	2403
1118	CUUCCCCC U CAACCAGU	629	ACUGGUUG CUGAUGAG X CGAA IGGGGAAG	2404
1120	UCCCCCUC A ACCAGUCU	630	AGACUGGU CUGAUGAG X CGAA IAGGGGGA	2405
1123	CCCUCAAC C AGUCUGAA	631	UUCAGACU CUGAUGAG X CGAA IUUGAGGG	2406
1124	CCUCAACC A GUCUGAAG	632	CUUCAGAC CUGAUGAG X CGAA IGUUGAGG	2407
1128	AACCAGUC U GAAGUGCU	633	AGCACUUC CUGAUGAG X CGAA IACUGGUU	2408
1136	UGAAGUGC U GGCCUCUG	634	CAGAGGCC CUGAUGAG X CGAA ICACUUCA	2409
1140	GUGCUGGC C UCUGUCGG	635	CCGACAGA CUGAUGAG X CGAA ICCAGCAC	2410
1141	UGCUGGCC U CUGUCGGA	636	UCCGACAG CUGAUGAG X CGAA IGCCAGCA	2411
1143	CUGGCCUC U GUCGGAGG	637	CCUCCGAC CUGAUGAG X CGAA IAGGCCAG	2412

Table 19

1156	GAGGGAGC A UGAUCAUU	638	AAUGAUCA CUGAUGAG X CGAA ICUCCCUC	2413
1162	GCAUGAUC A UUGGAGGU	639	ACCUCCAA CUGAUGAG X CGAA IAUCAUGC	2414
1177	GUAUCGAC C ACUCGCUG	640	CAGCGAGU CUGAUGAG X CGAA IUCGAUAC	2415
1178	UAUCGACC A CUCGCUGU	641	ACAGCGAG CUGAUGAG X CGAA IGUCGAUA	2416
1180	UCGACCAC U CGCUGUAC	642	GUACAGCG CUGAUGAG X CGAA IUGGUCGA	2417
1184	CCACUCGC U GUACACAG	643	CUGUGUAC CUGAUGAG X CGAA ICGAGUGG	2418
1189	CGCUGUAC A CAGGCAGU	644	ACUGCCUG CUGAUGAG X CGAA IUACAGCG	2419
1191	CUGUACAC A GGCAGUCU	645	AGACUGCC CUGAUGAG X CGAA IUGUACAG	2420
1195	ACACAGGC A GUCUCUGG	646	CCAGAGAC CUGAUGAG X CGAA ICCUGUGU	2421
1199	AGGCAGUC U CUGGUAUA	647	UAUACCAG CUGAUGAG X CGAA IACUGCCU	2422
1201	GCAGUCUC U GGUAUACA	648	UGUAUACC CUGAUGAG X CGAA IAGACUGC	2423
1209	UGGUAUAC A CCCAUCCG	649	CGGAUGGG CUGAUGAG X CGAA IUAUACCA	2424
1211	GUAUACAC C CAUCCGGC	650	GCCGGAUG CUGAUGAG X CGAA IUGUAUAC	2425
1212	UAUACACC C AUCCGGCG	651	CGCCGGAU CUGAUGAG X CGAA IGUGUAUA	2426
1213	AUACACCC A UCCGGCGG	652	CCGCCGGA CUGAUGAG X CGAA IGGUGUAU	2427
1216	CACCCAUC C GGCGGGAG	653	CUCCCGCC CUGAUGAG X CGAA IAUGGGUG	2428
1243	AGGUGAUC A UUGUGCGG	654	CCGCACAA CUGAUGAG X CGAA IAUCACCU	2429
1261	UGGAGAUC A AUGGACAG	655	CUGUCCAU CUGAUGAG X CGAA IAUCUCCA	2430
1268	CAAUGGAC A GGAUCUGA	656	UCAGAUCC CUGAUGAG X CGAA IUCCAUUG	2431
1274	ACAGGAUC U GAAAAUGG	657	CCAUUUUC CUGAUGAG X CGAA IAUCCUGU	2432
1285	AAAUGGAC U GCAAGGAG	658	CUCCUUGC CUGAUGAG X CGAA IUCCAUUU	2433
1288	UGGACUGC A AGGAGUAC	659	GUACUCCU CUGAUGAG X CGAA ICAGUCCA	2434
1297	AGGAGUAC A ACUAUGAC	660	GUCAUAGU CUGAUGAG X CGAA IUACUCCU	2435
1300	AGUACAAC U AUGACAAG	661	CUUGUCAU CUGAUGAG X CGAA IUUGUACU	2436
1306	ACUAUGAC A AGAGCAUU	662	AAUGCUCU CUGAUGAG X CGAA IUCAUAGU	2437
1312	ACAAGAGC A UUGUGGAC	663	GUCCACAA CUGAUGAG X CGAA ICUCUUGU	2438
1321	UUGUGGAC A GUGGCACC	664	GGUGCCAC CUGAUGAG X CGAA IUCCACAA	2439
1327	ACAGUGGC A CCACCAAC	665	GUUGGUGG CUGAUGAG X CGAA ICCACUGU	2440
1329	AGUGGCAC C ACCAACCU	666	AGGUUGGU CUGAUGAG X CGAA IUGCCACU	2441
1330	GUGGCACC A CCAACCUU	667	AAGGUUGG CUGAUGAG X CGAA IGUGCCAC	2442
1332	GGCACCAC C AACCUUCG	668	CGAAGGUU CUGAUGAG X CGAA IUGGUGCC	2443
1333	GCACCACC A ACCUUCGU	669	ACGAAGGU CUGAUGAG X CGAA IGUGGUGC	2444
1336	CCACCAAC C UUCGUUUG	670	CAAACGAA CUGAUGAG X CGAA IUUGGUGG	2445
1337	CACCAACC U UCGUUUGC	671	GCAAACGA CUGAUGAG X CGAA IGUUGGUG	2446
1346	UCGUUUGC C CAAGAAAG	672	CUUUCUUG CUGAUGAG X CGAA ICAAACGA	2447
1347	CGUUUGCC C AAGAAAGU	673	ACUUUCUU CUGAUGAG X CGAA IGCAAACG	2448
1348	GUUUGCCC A AGAAAGUG	674	CACUUUCU CUGAUGAG X CGAA IGGCAAAC	2449
1365	UUUGAAGC U GCAGUCAA	675	UUGACUGC CUGAUGAG X CGAA ICUUCAAA	2450
1368	GAAGCUGC A GUCAAAUC	676	GAUUUGAC CUGAUGAG X CGAA ICAGCUUC	2451
1372	CUGCAGUC A AAUCCAUC	677	GAUGGAUU CUGAUGAG X CGAA IACUGCAG	2452
1377	GUCAAAUC C AUCAAGGC	678	GCCUUGAU CUGAUGAG X CGAA IAUUUGAC	2453
1378	UCAAAUCC A UCAAGGCA	679	UGCCUUGA CUGAUGAG X CGAA IGAUUUGA	2454
1381	AAUCCAUC A AGGCAGCC	680	GGCUGCCU CUGAUGAG X CGAA IAUGGAUU	2455
1386	AUCAAGGC A GCCUCCUC	681	GAGGAGGC CUGAUGAG X CGAA ICCUUGAU	2456
1389	AAGGCAGC C UCCUCCAC	682	GUGGAGGA CUGAUGAG X CGAA ICUGCCUU	2457
1390	AGGCAGCC U CCUCCACG	683	CGUGGAGG CUGAUGAG X CGAA IGCUGCCU	2458
1392	GCAGCCUC C UCCACGGA	684	UCCGUGGA CUGAUGAG X CGAA IAGGCUGC	2459
1393	CAGCCUCC U CCACGGAG	685	CUCCGUGG CUGAUGAG X CGAA IGAGGCUG	2460
1395	GCCUCCUC C ACGGAGAA	686	UUCUCCGU CUGAUGAG X CGAA IAGGAGGC	2461
1396	CCUCCUCC A CGGAGAAG	687	CUUCUCCG CUGAUGAG X CGAA IGAGGAGG	2462
1408	AGAAGUUC C CUGAUGGU	688	ACCAUCAG CUGAUGAG X CGAA IAACUUCU	2463

Table 19

1409	GAAGUUCC C UGAUGGUU	689	AACCAUCA CUGAUGAG X CGAA IGAACUUC	2464
1410	AAGUUCCC U GAUGGUUU	690	AAACCAUC CUGAUGAG X CGAA IGGAACUU	2465
1420	AUGGUUUC U GGCUAGGA	691	UCCUAGCC CUGAUGAG X CGAA IAAACCAU	2466
1424	UUUCUGGC U AGGAGAGC	692	GCUCUCCU CUGAUGAG X CGAA ICCAGAAA	2467
1433	AGGAGAGC A GCUGGUGU	693	ACACCAGC CUGAUGAG X CGAA ICUCUCCU	2468
1436	AGAGCAGC U GGUGUGCU	694	AGCACACC CUGAUGAG X CGAA ICUGCUCU	2469
1444	UGGUGUGC U GGCAAGCA	695	UGCUUGCC CUGAUGAG X CGAA ICACACCA	2470
1448	GUGCUGGC A AGCAGGCA	696	UGCCUGCU CUGAUGAG X CGAA ICCAGCAC	2471
1452	UGGCAAGC A GGCACCAC	697	GUGGUGCC CUGAUGAG X CGAA ICUUGCCA	2472
1456	AAGCAGGC A CCACCCCU	698	AGGGGUGG CUGAUGAG X CGAA ICCUGCUU	2473
1458	GCAGGCAC C ACCCCUUG	699	CAAGGGGU CUGAUGAG X CGAA IUGCCUGC	2474
1459	CAGGCACC A CCCCUUGG	700	CCAAGGGG CUGAUGAG X CGAA IGUGCCUG	2475
1461	GGCACCAC C CCUUGGAA	701	UUCCAAGG CUGAUGAG X CGAA IUGGUGCC	2476
1462	GCACCACC C CUUGGAAC	702	GUUCCAAG CUGAUGAG X CGAA IGUGGUGC	2477
1463	CACCACCC C UUGGAACA	703	UGUUCCAA CUGAUGAG X CGAA IGGUGGUG	2478
1464	ACCACCCC U UGGAACAU	704	AUGUUCCA CUGAUGAG X CGAA IGGGUGGU	2479
1471	CUUGGAAC A UUUUCCCA	705	UGGGAAAA CUGAUGAG X CGAA IUUCCAAG	2480
1477	ACAUUUUC C CAGUCAUC	706	GAUGACUG CUGAUGAG X CGAA IAAAAUGU	2481
1478	CAUUUUCC C AGUCAUCU	707	AGAUGACU CUGAUGAG X CGAA IGAAAAUG	2482
1479	AUUUUCCC A GUCAUCUC	708	GAGAUGAC CUGAUGAG X CGAA IGGAAAAU	2483
1483	UCCCAGUC A UCUCACUC	709	GAGUGAGA CUGAUGAG X CGAA IACUGGGA	2484
1486	CAGUCAUC U CACUCUAC	710	GUAGAGUG CUGAUGAG X CGAA IAUGACUG	2485
1488	GUCAUCUC A CUCUACCU	711	AGGUAGAG CUGAUGAG X CGAA IAGAUGAC	2486
1490	CAUCUCAC U CUACCUAA	712	UUAGGUAG CUGAUGAG X CGAA IUGAGAUG	2487
1492	UCUCACUC U ACCUAAUG	713	CAUUAGGU CUGAUGAG X CGAA IAGUGAGA	2488
1495	CACUCUAC C UAAUGGGU	714	ACCCAUUA CUGAUGAG X CGAA IUAGAGUG	2489
1496	ACUCUACC U AAUGGGUG	715	CACCCAUU CUGAUGAG X CGAA IGUAGAGU	2490
1512	GAGGUUAC C AACCAGUC	716	GACUGGUU CUGAUGAG X CGAA IUAACCUC	2491
1513	AGGUUACC A ACCAGUCC	717	GGACUGGU CUGAUGAG X CGAA IGUAACCU	2492
1516	UUACCAAC C AGUCCUUC	718	GAAGGACU CUGAUGAG X CGAA IUUGGUAA	2493
1517	UACCAACC A GUCCUUCC	719	GGAAGGAC CUGAUGAG X CGAA IGUUGGUA	2494
1521	AACCAGUC C UUCCGCAU	720	AUGCGGAA CUGAUGAG X CGAA IACUGGUU	2495
1522	ACCAGUCC U UCCGCAUC	721	GAUGCGGA CUGAUGAG X CGAA IGACUGGU	2496
1525	AGUCCUUC C GCAUCACC	722	GGUGAUGC CUGAUGAG X CGAA IAAGGACU	2497
1528	CCUUCCGC A UCACCAUC	723	GAUGGUGA CUGAUGAG X CGAA ICGGAAGG	2498
1531	UCCGCAUC A CCAUCCUU	724	AAGGAUGG CUGAUGAG X CGAA IAUGCGGA	2499
1533	CGCAUCAC C AUCCUUCC	725	GGAAGGAU CUGAUGAG X CGAA IUGAUGCG	2500
1534	GCAUCACC A UCCUUCCG	726	CGGAAGGA CUGAUGAG X CGAA IGUGAUGC	2501
1537	UCACCAUC C UUCCGCAG	727	CUGCGGAA CUGAUGAG X CGAA IAUGGUGA	2502
1538	CACCAUCC U UCCGCAGC	728	GCUGCGGA CUGAUGAG X CGAA IGAUGGUG	2503
1541	CAUCCUUC C GCAGCAAU	729	AUUGCUGC CUGAUGAG X CGAA IAAGGAUG	2504
1544	CCUUCCGC A GCAAUACC	730	GGUAUUGC CUGAUGAG X CGAA ICGGAAGG	2505
1547	UCCGCAGC A AUACCUGC	731	GCAGGUAU CUGAUGAG X CGAA ICUGCGGA	2506
1552	AGCAAUAC C UGCGGCCA	732	UGGCCGCA CUGAUGAG X CGAA IUAUUGCU	2507
1553	GCAAUACC U GCGGCCAG	733	CUGGCCGC CUGAUGAG X CGAA IGUAUUGC	2508
1559	CCUGCGGC C AGUGGAAG	734	CUUCCACU CUGAUGAG X CGAA ICCGCAGG	2509
1560	CUGCGGCC A GUGGAAGA	735	UCUUCCAC CUGAUGAG X CGAA IGCCGCAG	2510
1575	GAUGUGGC C ACGUCCCA	736	UGGGACGU CUGAUGAG X CGAA ICCACAUC	2511
1576	AUGUGGCC A CGUCCCAA	737	UUGGGACG CUGAUGAG X CGAA IGCCACAU	2512
1581	GCCACGUC C CAAGACGA	738	UCGUCUUG CUGAUGAG X CGAA IACGUGGC	2513
1582	CCACGUCC C AAGACGAC	739	GUCGUCUU CUGAUGAG X CGAA IGACGUGG	2514

Table 19

1583	CACGUCCC A AGACGACU	740	AGUCGUCU CUGAUGAG X CGAA IGGACGUG	2515
1591	AAGACGAC U GUUACAAG	741	CUUGUAAC CUGAUGAG X CGAA IUCGUCUU	2516
1597	ACUGUUAC A AGUUUGCC	742	GGCAAACU CUGAUGAG X CGAA IUAACAGU	2517
1605	AAGUUUGC C AUCUCACA	743	UGUGAGAU CUGAUGAG X CGAA ICAAACUU	2518
1606	AGUUUGCC A UCUCACAG	744	CUGUGAGA CUGAUGAG X CGAA IGCAAACU	2519
1609	UUGCCAUC U CACAGUCA	745	UGACUGUG CUGAUGAG X CGAA IAUGGCAA	2520
1611	GCCAUCUC A CAGUCAUC	746	GAUGACUG CUGAUGAG X CGAA IAGAUGGC	2521
1613	CAUCUCAC A GUCAUCCA	747	UGGAUGAC CUGAUGAG X CGAA IUGAGAUG	2522
1617	UCACAGUC A UCCACGGG	748	CCCGUGGA CUGAUGAG X CGAA IACUGUGA	2523
1620	CAGUCAUC C ACGGGCAC	749	GUGCCCGU CUGAUGAG X CGAA IAUGACUG	2524
1621	AGUCAUCC A CGGGCACU	750	AGUGCCCG CUGAUGAG X CGAA IGAUGACU	2525
1627	CCACGGGC A CUGUUAUG	751	CAUAACAG CUGAUGAG X CGAA ICCCGUGG	2526
1629	ACGGGCAC U GUUAUGGG	752	CCCAUAAC CUGAUGAG X CGAA IUGCCCGU	2527
1641	AUGGGAGC U GUUAUCAU	753	AUGAUAAC CUGAUGAG X CGAA ICUCCCAU	2528
1648	CUGUUAUC A UGGAGGGC	754	GCCCUCCA CUGAUGAG X CGAA IAUAACAG	2529
1657	UGGAGGGC U UCUACGUU	755	AACGUAGA CUGAUGAG X CGAA ICCCUCCA	2530
1660	AGGGCUUC U ACGUUGUC	756	GACAACGU CUGAUGAG X CGAA IAAGCCCU	2531
1669	ACGUUGUC U UUGAUCGG	757	CCGAUCAA CUGAUGAG X CGAA IACAACGU	2532
1680	GAUCGGGC C CGAAAACG	758	CGUUUUCG CUGAUGAG X CGAA ICCCGAUC	2533
1681	AUCGGGCC C GAAAACGA	759	UCGUUUUC CUGAUGAG X CGAA IGCCCGAU	2534
1696	GAAUUGGC U UUGCUGUC	760	GACAGCAA CUGAUGAG X CGAA ICCAAUUC	2535
1701	GGCUUUGC U GUCAGCGC	761	GCGCUGAC CUGAUGAG X CGAA ICAAAGCC	2536
1705	UUGCUGUC A GCGCUUGC	762	GCAAGCGC CUGAUGAG X CGAA IACAGCAA	2537
1710	GUCAGCGC U UGCCAUGU	763	ACAUGGCA CUGAUGAG X CGAA ICGCUGAC	2538
1714	GCGCUUGC C AUGUGCAC	764	GUGCACAU CUGAUGAG X CGAA ICAAGCGC	2539
1715	CGCUUGCC A UGUGCACG	765	CGUGCACA CUGAUGAG X CGAA IGCAAGCG	2540
1721	CCAUGUGC A CGAUGAGU	766	ACUCAUCG CUGAUGAG X CGAA ICACAUGG	2541
1732	AUGAGUUC A GGACGGCA	767	UGCCGUCC CUGAUGAG X CGAA IAACUCAU	2542
1740	AGGACGGC A GCGGUGGA	768	UCCACCGC CUGAUGAG X CGAA ICCGUCCU	2543
1753	UGGAAGGC C CUUUUGUC	769	GACAAAAG CUGAUGAG X CGAA ICCUUCCA	2544
1754	GGAAGGCC C UUUUGUCA	770	UGACAAAA CUGAUGAG X CGAA IGCCUUCC	2545
1755	GAAGGCCC U UUUGUCAC	771	GUGACAAA CUGAUGAG X CGAA IGGCCUUC	2546
1762	CUUUUGUC A CCUUGGAC	772	GUCCAAGG CUGAUGAG X CGAA IACAAAAG	2547
1764	UUUGUCAC C UUGGACAU	773	AUGUCCAA CUGAUGAG X CGAA IUGACAAA	2548
1765	UUGUCACC U UGGACAUG	774	CAUGUCCA CUGAUGAG X CGAA IGUGACAA	2549
1771	CCUUGGAC A UGGAAGAC	775	GUCUUCCA CUGAUGAG X CGAA IUCCAAGG	2550
1780	UGGAAGAC U GUGGCUAC	776	GUAGCCAC CUGAUGAG X CGAA IUCUUCCA	2551
1786	ACUGUGGC U ACAACAUU	777	AAUGUUGU CUGAUGAG X CGAA ICCACAGU	2552
1789	GUGGCUAC A ACAUUCCA	778	UGGAAUGU CUGAUGAG X CGAA IUAGCCAC	2553
1792	GCUACAAC A UUCCACAG	779	CUGUGGAA CUGAUGAG X CGAA IUUGUAGC	2554
1796	CAACAUUC C ACAGACAG	780	CUGUCUGU CUGAUGAG X CGAA IAAUGUUG	2555
1797	AACAUUCC A CAGACAGA	781	UCUGUCUG CUGAUGAG X CGAA IGAAUGUU	2556
1799	CAUUCCAC A GACAGAUG	782	CAUCUGUC CUGAUGAG X CGAA IUGGAAUG	2557
1803	CCACAGAC A GAUGAGUC	783	GACUCAUC CUGAUGAG X CGAA IUCUGUGG	2558
1812	GAUGAGUC A ACCCUCAU	784	AUGAGGGU CUGAUGAG X CGAA IACUCAUC	2559
1815	GAGUCAAC C CUCAUGAC	785	GUCAUGAG CUGAUGAG X CGAA IUUGACUC	2560
1816	AGUCAACC C UCAUGACC	786	GGUCAUGA CUGAUGAG X CGAA IGUUGACU	2561
1817	GUCAACCC U CAUGACCA	787	UGGUCAUG CUGAUGAG X CGAA IGGUUGAC	2562
1819	CAACCCUC A UGACCAUA	788	UAUGGUCA CUGAUGAG X CGAA IAGGGUUG	2563
1824	CUCAUGAC C AUAGCCUA	789	UAGGCUAU CUGAUGAG X CGAA IUCAUGAG	2564
1825	UCAUGACC A UAGCCUAU	790	AUAGGCUA CUGAUGAG X CGAA IGUCAUGA	2565

Table 19

1830	ACCAUAGC C UAUGUCAU	791	AUGACAUA CUGAUGAG X CGAA ICUAUGGU	2566
1831	CCAUAGCC U AUGUCAUG	792	CAUGACAU CUGAUGAG X CGAA IGCUAUGG	2567
1837	CCUAUGUC A UGGCUGCC	793	GGCAGCCA CUGAUGAG X CGAA IACAUAGG	2568
1842	GUCAUGGC U GCCAUCUG	794	CAGAUGGC CUGAUGAG X CGAA ICCAUGAC	2569
1845	AUGGCUGC C AUCUGCGC	795	GCGCAGAU CUGAUGAG X CGAA ICAGCCAU	2570
1846	UGGCUGCC A UCUGCGCC	796	GGCGCAGA CUGAUGAG X CGAA IGCAGCCA	2571
1849	CUGCCAUC U GCGCCCUC	797	GAGGGCGC CUGAUGAG X CGAA IAUGGCAG	2572
1854	AUCUGCGC C CUCUUCAU	798	AUGAAGAG CUGAUGAG X CGAA ICGCAGAU	2573
1855	UCUGCGCC C UCUUCAUG	799	CAUGAAGA CUGAUGAG X CGAA IGCGCAGA	2574
1856	CUGCGCCC U CUUCAUGC	800	GCAUGAAG CUGAUGAG X CGAA IGGCGCAG	2575
1858	GCGCCCUC U UCAUGCUG	801	CAGCAUGA CUGAUGAG X CGAA IAGGGCGC	2576
1861	CCCUCUUC A UGCUGCCA	802	UGGCAGCA CUGAUGAG X CGAA IAAGAGGG	2577
1865	CUUCAUGC U GCCACUCU	803	AGAGUGGC CUGAUGAG X CGAA ICAUGAAG	2578
1868	CAUGCUGC C ACUCUGCC	804	GGCAGAGU CUGAUGAG X CGAA ICAGCAUG	2579
1869	AUGCUGCC A CUCUGCCU	805	AGGCAGAG CUGAUGAG X CGAA IGCAGCAU	2580
1871	GCUGCCAC U CUGCCUCA	806	UGAGGCAG CUGAUGAG X CGAA IUGGCAGC	2581
1873	UGCCACUC U GCCUCAUG	807	CAUGAGGC CUGAUGAG X CGAA IAGUGGCA	2582
1876	CACUCUGC C UCAUGGUG	808	CACCAUGA CUGAUGAG X CGAA ICAGAGUG	2583
1877	ACUCUGCC U CAUGGUGU	809	ACACCAUG CUGAUGAG X CGAA IGCAGAGU	2584
1879	UCUGCCUC A UGGUGUGU	810	ACACACCA CUGAUGAG X CGAA IAGGCAGA	2585
1889	GGUGUGUC A GUGGCGCU	811	AGCGCCAC CUGAUGAG X CGAA IACACACC	2586
1897	AGUGGCGC U GCCUCCGC	812	GCGGAGGC CUGAUGAG X CGAA ICGCCACU	2587
1900	GGCGCUGC C UCCGCUGC	813	GCAGCGGA CUGAUGAG X CGAA ICAGCGCC	2588
1901	GCGCUGCC U CCGCUGCC	814	GGCAGCGG CUGAUGAG X CGAA IGCAGCGC	2589
1903	GCUGCCUC C GCUGCCUG	815	CAGGCAGC CUGAUGAG X CGAA IAGGCAGC	2590
1906	GCCUCCGC U GCCUGCGC	816	GCGCAGGC CUGAUGAG X CGAA ICGGAGGC	2591
1909	UCCGCUGC C UGCGCCAG	817	CUGGCGCA CUGAUGAG X CGAA ICAGCGGA	2592
1910	CCGCUGCC U GCGCCAGC	818	GCUGGCGC CUGAUGAG X CGAA IGCAGCGG	2593
1915	GCCUGCGC C AGCAGCAU	819	AUGCUGCU CUGAUGAG X CGAA ICGCAGGC	2594
1916	CCUGCGCC A GCAGCAUG	820	CAUGCUGC CUGAUGAG X CGAA IGCGCAGG	2595
1919	GCGCCAGC A GCAUGAUG	821	CAUCAUGC CUGAUGAG X CGAA ICUGGCGC	2596
1922	CCAGCAGC A UGAUGACU	822	AGUCAUCA CUGAUGAG X CGAA ICUGCUGG	2597
1930	AUGAUGAC U UUGCUGAU	823	AUCAGCAA CUGAUGAG X CGAA IUCAUCAU	2598
1935	GACUUUGC U GAUGACAU	824	AUGUCAUC CUGAUGAG X CGAA ICAAAGUC	2599
1942	CUGAUGAC A UCUCCCUG	825	CAGGGAGA CUGAUGAG X CGAA IUCAUCAG	2600
1945	AUGACAUC U CCCUGCUG	826	CAGCAGGG CUGAUGAG X CGAA IAUGUCAU	2601
1947	GACAUCUC C CUGCUGAA	827	UUCAGCAG CUGAUGAG X CGAA IAGAUGUC	2602
1948	ACAUCUCC C UGCUGAAG	828	CUUCAGCA CUGAUGAG X CGAA IGAGAUGU	2603
1949	CAUCUCCC U GCUGAAGU	829	ACUUCAGC CUGAUGAG X CGAA IGGAGAUG	2604
1952	CUCCCUGC U GAAGUGAG	830	CUCACUUC CUGAUGAG X CGAA ICAGGGAG	2605
1966	GAGGAGGC C CAUGGGCA	831	UGCCCAUG CUGAUGAG X CGAA ICCUCCUC	2606
1967	AGGAGGCC C AUGGGCAG	832	CUGCCCAU CUGAUGAG X CGAA IGCCUCCU	2607
1968	GGAGGCCC A UGGGCAGA	833	UCUGCCCA CUGAUGAG X CGAA IGGCCUCC	2608
1974	CCAUGGGC A GAAGAUAG	834	CUAUCUUC CUGAUGAG X CGAA ICCCAUGG	2609
1989	AGAGAUUC C CCUGGACC	835	GGUCCAGG CUGAUGAG X CGAA IAAUCUCU	2610
1990	GAGAUUCC C CUGGACCA	836	UGGUCCAG CUGAUGAG X CGAA IGAAUCUC	2611
1991	AGAUUCCC C UGGACCAC	837	GUGGUCCA CUGAUGAG X CGAA IGGAAUCU	2612
1992	GAUUCCCC U GGACCACA	838	UGUGGUCC CUGAUGAG X CGAA IGGGAAUC	2613
1997	CCCUGGAC C ACACCUCC	839	GGAGGUGU CUGAUGAG X CGAA IUCCAGGG	2614
1998	CCUGGACC A CACCUCCG	840	CGGAGGUG CUGAUGAG X CGAA IGUCCAGG	2615
2000	UGGACCAC A CCUCCGUG	841	CACGGAGG CUGAUGAG X CGAA IUGGUCCA	2616

Table 19

2002	GACCACAC C UCCGUGGU	842	ACCACGGA CUGAUGAG X CGAA IUGUGGUC	2617
2003	ACCACACC U CCGUGGUU	843	AACCACGG CUGAUGAG X CGAA IGUGUGGU	2618
2005	CACACCUC C GUGGUUCA	844	UGAACCAC CUGAUGAG X CGAA IAGGUGUG	2619
2013	CGUGGUUC A CUUUGGUC	845	GACCAAAG CUGAUGAG X CGAA IAACCACG	2620
2015	UGGUUCAC U UUGGUCAC	846	GUGACCAA CUGAUGAG X CGAA IUGAACCA	2621
2022	CUUUGGUC A CAAGUAGG	847	CCUACUUG CUGAUGAG X CGAA IACCAAAG	2622
2024	UUGGUCAC A AGUAGGAG	848	CUCCUACU CUGAUGAG X CGAA IUGACCAA	2623
2035	UAGGAGAC A CAGAUGGC	849	GCCAUCUG CUGAUGAG X CGAA IUCUCCUA	2624
2037	GGAGACAC A GAUGGCAC	850	GUGCCAUC CUGAUGAG X CGAA IUGUCUCC	2625
2044	CAGAUGGC A CCUGUGGC	851	GCCACAGG CUGAUGAG X CGAA ICCAUCUG	2626
2046	GAUGGCAC C UGUGGCCA	852	UGGCCACA CUGAUGAG X CGAA IUGCCAUC	2627
2047	AUGGCACC U GUGGCCAG	853	CUGGCCAC CUGAUGAG X CGAA IGUGCCAU	2628
2053	CCUGUGGC C AGAGCACC	854	GGUGCUCU CUGAUGAG X CGAA ICCACAGG	2629
2054	CUGUGGCC A GAGCACCU	855	AGGUGCUC CUGAUGAG X CGAA IGCCACAG	2630
2059	GCCAGAGC A CCUCAGGA	856	UCCUGAGG CUGAUGAG X CGAA ICUCUGGC	2631
2061	CAGAGCAC C UCAGGACC	857	GGUCCUGA CUGAUGAG X CGAA IUGCUCUG	2632
2062	AGAGCACC U CAGGACCC	858	GGGUCCUG CUGAUGAG X CGAA IGUGCUCU	2633
2064	AGCACCUC A GGACCCUC	859	GAGGGUCC CUGAUGAG X CGAA IAGGUGCU	2634
2069	CUCAGGAC C CUCCCCAC	860	GUGGGGAG CUGAUGAG X CGAA IUCCUGAG	2635
2070	UCAGGACC C UCCCCACC	861	GGUGGGGA CUGAUGAG X CGAA IGUCCUGA	2636
2071	CAGGACCC U CCCCACCC	862	GGGUGGGG CUGAUGAG X CGAA IGGUCCUG	2637
2073	GGACCCUC C CCACCCAC	863	GUGGGUGG CUGAUGAG X CGAA IAGGGUCC	2638
2074	GACCCUCC C CACCCACC	864	GGUGGGUG CUGAUGAG X CGAA IGAGGGUC	2639
2075	ACCCUCCC C ACCCACCA	865	UGGUGGGU CUGAUGAG X CGAA IGGAGGGU	2640
2076	CCCUCCCC A CCCACCAA	866	UUGGUGGG CUGAUGAG X CGAA IGGGAGGG	2641
2078	CUCCCCAC C CACCAAAU	867	AUUUGGUG CUGAUGAG X CGAA IUGGGGAG	2642
2079	UCCCCACC C ACCAAAUG	868	CAUUUGGU CUGAUGAG X CGAA IGUGGGGA	2643
2080	CCCCACCC A CCAAAUGC	869	GCAUUUGG CUGAUGAG X CGAA IGGUGGGG	2644
2082	CCACCCAC C AAAUGCCU	870	AGGCAUUU CUGAUGAG X CGAA IUGGGUGG	2645
2083	CACCCACC A AAUGCCUC	871	GAGGCAUU CUGAUGAG X CGAA IGUGGGUG	2646
2089	CCAAAUGC C UCUGCCUU	872	AAGGCAGA CUGAUGAG X CGAA ICAUUUGG	2647
2090	CAAAUGCC U CUGCCUUG	873	CAAGGCAG CUGAUGAG X CGAA IGCAUUUG	2648
2092	AAUGCCUC U GCCUUGAU	874	AUCAAGGC CUGAUGAG X CGAA IAGGCAUU	2649
2095	GCCUCUGC C UUGAUGGA	875	UCCAUCAA CUGAUGAG X CGAA ICAGAGGC	2650
2096	CCUCUGCC U UGAUGGAG	876	CUCCAUCA CUGAUGAG X CGAA IGCAGAGG	2651
2116	GAAAAGGC U GGCAAGGU	877	ACCUUGCC CUGAUGAG X CGAA ICCUUUUC	2652
2120	AGGCUGGC A AGGUGGGU	878	ACCCACCU CUGAUGAG X CGAA ICCAGCCU	2653
2131	GUGGGUUC C AGGGACUG	879	CAGUCCCU CUGAUGAG X CGAA IAACCCAC	2654
2132	UGGGUUCC A GGGACUGU	880	ACAGUCCC CUGAUGAG X CGAA IGAACCCA	2655
2138	CCAGGGAC U GUACCUGU	881	ACAGGUAC CUGAUGAG X CGAA IUCCCUGG	2656
2143	GACUGUAC C UGUAGGAA	882	UUCCUACA CUGAUGAG X CGAA IUACAGUC	2657
2144	ACUGUACC U GUAGGAAA	883	UUUCCUAC CUGAUGAG X CGAA IGUACAGU	2658
2154	UAGGAAAC A GAAAAGAG	884	CUCUUUUC CUGAUGAG X CGAA IUUUCCUA	2659
2174	AAAGAAGC A CUCUGCUG	885	CAGCAGAG CUGAUGAG X CGAA ICUUCUUU	2660
2176	AGAAGCAC U CUGCUGGC	886	GCCAGCAG CUGAUGAG X CGAA IUGCUUCU	2661
2178	AAGCACUC U GCUGGCGG	887	CCGCCAGC CUGAUGAG X CGAA IAGUGCUU	2662
2181	CACUCUGC U GGCGGGAA	888	UUCCCGCC CUGAUGAG X CGAA ICAGAGUG	2663
2193	GGGAAUAC U CUUGGUCA	889	UGACCAAG CUGAUGAG X CGAA IUAUUCCC	2664
2195	GAAUACUC U UGGUCACC	890	GGUGACCA CUGAUGAG X CGAA IAGUAUUC	2665
2201	UCUUGGUC A CCUCAAAU	891	AUUUGAGG CUGAUGAG X CGAA IACCAAGA	2666
2203	UUGGUCAC C UCAAAUUU	892	AAAUUUGA CUGAUGAG X CGAA IUGACCAA	2667

Table 19

2204	UGGUCACC U CAAAUUUA	893	UAAAUUUG CUGAUGAG X CGAA IGUGACCA	2668
2206	GUCACCUC A AAUUUAAG	894	CUUAAAUU CUGAUGAG X CGAA IAGGUGAC	2669
2226	GGAAAUUC U GCUGCUUG	895	CAAGCAGC CUGAUGAG X CGAA IAAUUUCC	2670
2229	AAUUCUGC U GCUUGAAA	896	UUUCAAGC CUGAUGAG X CGAA ICAGAAUU	2671
2232	UCUGCUGC U UGAAACUU	897	AAGUUUCA CUGAUGAG X CGAA ICAGCAGA	2672
2239	CUUGAAAC U UCAGCCCU	898	AGGGCUGA CUGAUGAG X CGAA IUUUCAAG	2673
2242	GAAACUUC A GCCCUGAA	899	UUCAGGGC CUGAUGAG X CGAA IAAGUUUC	2674
2245	ACUUCAGC C CUGAACCU	900	AGGUUCAG CUGAUGAG X CGAA ICUGAAGU	2675
2246	CUUCAGCC C UGAACCUU	901	AAGGUUCA CUGAUGAG X CGAA IGCUGAAG	2676
2247	UUCAGCCC U GAACCUUU	902	AAAGGUUC CUGAUGAG X CGAA IGGCUGAA	2677
2252	CCCUGAAC C UUUGUCCA	903	UGGACAAA CUGAUGAG X CGAA IUUCAGGG	2678
2253	CCUGAACC U UUGUCCAC	904	GUGGACAA CUGAUGAG X CGAA IGUUCAGG	2679
2259	CCUUUGUC C ACCAUUCC	905	GGAAUGGU CUGAUGAG X CGAA IACAAAGG	2680
2260	CUUUGUCC A CCAUUCCU	906	AGGAAUGG CUGAUGAG X CGAA IGACAAAG	2681
2262	UUGUCCAC C AUUCCUUU	907	AAAGGAAU CUGAUGAG X CGAA IUGGACAA	2682
2263	UGUCCACC A UUCCUUUA	908	UAAAGGAA CUGAUGAG X CGAA IGUGGACA	2683
2267	CACCAUUC C UUUAAAUU	909	AAUUUAAA CUGAUGAG X CGAA IAAUGGUG	2684
2268	ACCAUUCC U UUAAAUUC	910	GAAUUUAA CUGAUGAG X CGAA IGAAUGGU	2685
2277	UUAAAUUC U CCAACCCA	911	UGGGUUGG CUGAUGAG X CGAA IAAUUUAA	2686
2279	AAAUUCUC C AACCCAAA	912	UUUGGGUU CUGAUGAG X CGAA IAGAAUUU	2687
2280	AAUUCUCC A ACCCAAAG	913	CUUUGGGU CUGAUGAG X CGAA IGAGAAUU	2688
2283	UCUCCAAC C CAAAGUAU	914	AUACUUUG CUGAUGAG X CGAA IUUGGAGA	2689
2284	CUCCAACC C AAAGUAUU	915	AAUACUUU CUGAUGAG X CGAA IGUUGGAG	2690
2285	UCCAACCC A AAGUAUUC	916	GAAUACUU CUGAUGAG X CGAA IGGUUGGA	2691
2294	AAGUAUUC U UCUUUUCU	917	AGAAAAGA CUGAUGAG X CGAA IAAUACUU	2692
2297	UAUUCUUC U UUUCUUAG	918	CUAAGAAA CUGAUGAG X CGAA IAAGAAUA	2693
2302	UUCUUUUC U UAGUUUCA	919	UGAAACUA CUGAUGAG X CGAA IAAAAGAA	2694
2310	UUAGUUUC A GAAGUACU	920	AGUACUUC CUGAUGAG X CGAA IAAACUAA	2695
2318	AGAAGUAC U GGCAUCAC	921	GUGAUGCC CUGAUGAG X CGAA IUACUUCU	2696
2322	GUACUGGC A UCACACGC	922	GCGUGUGA CUGAUGAG X CGAA ICCAGUAC	2697
2325	CUGGCAUC A CACGCAGG	923	CCUGCGUG CUGAUGAG X CGAA IAUGCCAG	2698
2327	GGCAUCAC A CGCAGGUU	924	AACCUGCG CUGAUGAG X CGAA IUGAUGCC	2699
2331	UCACACGC A GGUUACCU	925	AGGUAACC CUGAUGAG X CGAA ICGUGUGA	2700
2338	CAGGUUAC C UUGGCGUG	926	CACGCCAA CUGAUGAG X CGAA IUAACCUG	2701
2339	AGGUUACC U UGGCGUGU	927	ACACGCCA CUGAUGAG X CGAA IGUAACCU	2702
2351	CGUGUGUC C CUGUGGUA	928	UACCACAG CUGAUGAG X CGAA IACACACG	2703
2352	GUGUGUCC C UGUGGUAC	929	GUACCACA CUGAUGAG X CGAA IGACACAC	2704
2353	UGUGUCCC U GUGGUACC	930	GGUACCAC CUGAUGAG X CGAA IGGACACA	2705
2361	UGUGGUAC C CUGGCAGA	931	UCUGCCAG CUGAUGAG X CGAA IUACCACA	2706
2362	GUGGUACC C UGGCAGAG	932	CUCUGCCA CUGAUGAG X CGAA IGUACCAC	2707
2363	UGGUACCC U GGCAGAGA	933	UCUCUGCC CUGAUGAG X CGAA IGGUACCA	2708
2367	ACCCUGGC A GAGAAGAG	934	CUCUUCUC CUGAUGAG X CGAA ICCAGGGU	2709
2378	GAAGAGAC C AAGCUUGU	935	ACAAGCUU CUGAUGAG X CGAA IUCUCUUC	2710
2379	AAGAGACC A AGCUUGUU	936	AACAAGCU CUGAUGAG X CGAA IGUCUCUU	2711
2383	GACCAAGC U UGUUUCCC	937	GGGAAACA CUGAUGAG X CGAA ICUUGGUC	2712
2390	CUUGUUUC C CUGCUGGC	938	GCCAGCAG CUGAUGAG X CGAA IAAACAAG	2713
2391	UUGUUUCC C UGCUGGCC	939	GGCCAGCA CUGAUGAG X CGAA IGAAACAA	2714
2392	UGUUUCCC U GCUGGCCA	940	UGGCCAGC CUGAUGAG X CGAA IGGAAACA	2715
2395	UUCCCUGC U GGCCAAAG	941	CUUUGGCC CUGAUGAG X CGAA ICAGGGAA	2716
2399	CUGCUGGC C AAAGUCAG	942	CUGACUUU CUGAUGAG X CGAA ICCAGCAG	2717
2400	UGCUGGCC A AAGUCAGU	943	ACUGACUU CUGAUGAG X CGAA IGCCAGCA	2718

Table 19

2406	CCAAAGUC A GUAGGAGA	944	UCUCCUAC CUGAUGAG X CGAA IACUUUGG	2719
2421	GAGGAUGC A CAGUUUGC	945	GCAAACUG CUGAUGAG X CGAA ICAUCCUC	2720
2423	GGAUGCAC A GUUUGCUA	946	UAGCAAAC CUGAUGAG X CGAA IUGCAUCC	2721
2430	CAGUUUGC U AUUUGCUU	947	AAGCAAAU CUGAUGAG X CGAA ICAAACUG	2722
2437	CUAUUUGC U UUAGAGAC	948	GUCUCUAA CUGAUGAG X CGAA ICAAAUAG	2723
2446	UUAGAGAC A GGGACUGU	949	ACAGUCCC CUGAUGAG X CGAA IUCUCUAA	2724
2452	ACAGGGAC U GUAUAAAC	950	GUUUAUAC CUGAUGAG X CGAA IUCCCUGU	2725
2461	GUAUAAAC A AGCCUAAC	951	GUUAGGCU CUGAUGAG X CGAA IUUUAUAC	2726
2465	AAACAAGC C UAACAUUG	952	CAAUGUUA CUGAUGAG X CGAA ICUUGUUU	2727
2466	AACAAGCC U AACAUUGG	953	CCAAUGUU CUGAUGAG X CGAA IGCUUGUU	2728
2470	AGCCUAAC A UUGGUGCA	954	UGCACCAA CUGAUGAG X CGAA IUUAGGCU	2729
2478	AUUGGUGC A AAGAUUGC	955	GCAAUCUU CUGAUGAG X CGAA ICACCAAU	2730
2487	AAGAUUGC C UCUUGAAU	956	AUUCAAGA CUGAUGAG X CGAA ICAAUCUU	2731
2488	AGAUUGCC U CUUGAAUU	957	AAUUCAAG CUGAUGAG X CGAA IGCAAUCU	2732
2490	AUUGCCUC U UGAAUUAA	958	UUAAUUCA CUGAUGAG X CGAA IAGGCAAU	2733
2509	AAAAAAAC U AGAAAAAA	959	UUUUUUCU CUGAUGAG X CGAA IUUUUUUU	2734

Input Sequence = AF190725. Cut Site = G/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
AF190725 (Homo sapiens beta-site APP cleaving enzyme (BACE) mRNA; 2526 bp)

Table 20

Table 20: Human BACE G-cleaver Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
11	ACGCGUCC G CAGCCCGC	960	GCGGGCUG UGAUG GCAUGCACUAUGC GCG GGACGCGU	2735
18	CGCAGCCC G CCCGGGAG	961	CUCCCGGG UGAUG GCAUGCACUAUGC GCG GGGCUGCG	2736
29	CGGGAGCU G CGAGCCGC	962	GCGGCUCG UGAUG GCAUGCACUAUGC GCG AGCUCCCG	2737
31	GGAGCUGC G AGCCGCGA	963	UCGCGGCU UGAUG GCAUGCACUAUGC GCG GCAGCUCC	2738
36	UGCGAGCC G CGAGCUGG	964	CCAGCUCG UGAUG GCAUGCACUAUGC GCG GGCUCGCA	2739
38	CGAGCCGC G AGCUGGAU	965	AUCCAGCU UGAUG GCAUGCACUAUGC GCG GCGGCUCG	2740
58	GGUGGCCU G AGCAGCCA	966	UGGCUGCU UGAUG GCAUGCACUAUGC GCG AGGCCACC	2741
69	CAGCCAAC G CAGCCGCA	967	UGCGGCUG UGAUG GCAUGCACUAUGC GCG GUUGGCUG	2742
75	ACGCAGCC G CAGGAGCC	968	GGCUCCUG UGAUG GCAUGCACUAUGC GCG GGCUGCGU	2743
94	GAGCCCUU G CCCCUGCC	969	GGCAGGGG UGAUG GCAUGCACUAUGC GCG AAGGGCUC	2744
100	UUGCCCCU G CCCGCGCC	970	GGCGCGGG UGAUG GCAUGCACUAUGC GCG AGGGGCAA	2745
104	CCCUGCCC G CGCCGCCG	971	CGGCGGCG UGAUG GCAUGCACUAUGC GCG GGGCAGGG	2746
106	CUGCCCGC G CCGCCGCC	972	GGCGGCGG UGAUG GCAUGCACUAUGC GCG GCGGGCAG	2747
109	CCCGCGCC G CCGCCCGC	973	GCGGGCGG UGAUG GCAUGCACUAUGC GCG GGCGCGGG	2748
112	GCGCCGCC G CCCGCCGG	974	CCGGCGGG UGAUG GCAUGCACUAUGC GCG GGCGGCGC	2749
116	CGCCGCCC G CCGGGGGG	975	CCCCCCGG UGAUG GCAUGCACUAUGC GCG GGGCGGCG	2750
137	GGGAAGCC G CCACCGGC	976	GCCGGUGG UGAUG GCAUGCACUAUGC GCG GGCUUCCC	2751
148	ACCGGCCC G CCAUGCCC	977	GGGCAUGG UGAUG GCAUGCACUAUGC GCG GGGCCGGU	2752
153	CCCGCCAU G CCCGCCCC	978	GGGGCGGG UGAUG GCAUGCACUAUGC GCG AUGGCGGG	2753
157	CCAUGCCC G CCCCUCCC	979	GGGAGGGG UGAUG GCAUGCACUAUGC GCG GGGCAUGG	2754
172	CCAGCCCC G CCGGGAGC	980	GCUCCCGG UGAUG GCAUGCACUAUGC GCG GGGGCUGG	2755
183	GGGAGCCC G CGCCCGCU	981	AGCGGGCG UGAUG GCAUGCACUAUGC GCG GGGCUCCC	2756
185	GAGCCCGC G CCCGCUGC	982	GCAGCGGG UGAUG GCAUGCACUAUGC GCG GCGGGCUC	2757
189	CCGCGCCC G CUGCCCAG	983	CUGGGCAG UGAUG GCAUGCACUAUGC GCG GGGCGCGG	2758
192	CGCCCGCU G CCCAGGCU	984	AGCCUGGG UGAUG GCAUGCACUAUGC GCG AGCGGGCG	2759
205	GGCUGGCC G CCGCCGUG	985	CACGGCGG UGAUG GCAUGCACUAUGC GCG GGCCAGCC	2760
208	UGGCCGCC G CCGUGCCG	986	CGGCACGG UGAUG GCAUGCACUAUGC GCG GGCGGCCA	2761
213	GCCGCCGU G CCGAUGUA	987	UACAUCGG UGAUG GCAUGCACUAUGC GCG ACGGCGGC	2762
216	GCCGUGCC G AUGUAGCG	988	CGCUACAU UGAUG GCAUGCACUAUGC GCG GGCACGGC	2763
250	UCUCCCCU G CUCCCGUG	989	CACGGGAG UGAUG GCAUGCACUAUGC GCG AGGGGAGA	2764

Table 20

258	GCUCCCGU G CUCUGCGG	990	CCGCAGAG UGAUG GCAUGCACUAUGC GCG ACGGGAGC	2765
263	CGUGCUCU G CGGAUCUC	991	GAGAUCCG UGAUG GCAUGCACUAUGC GCG AGAGCACG	2766
276	UCUCCCCU G ACCGCUCU	992	AGAGCGGU UGAUG GCAUGCACUAUGC GCG AGGGGAGA	2767
280	CCCUGACC G CUCUCCAC	993	GUGGAGAG UGAUG GCAUGCACUAUGC GCG GGUCAGGG	2768
320	AGGGCCCU G CAGGCCCU	994	AGGGCCUG UGAUG GCAUGCACUAUGC GCG AGGGCCCU	2769
337	GGCGUCCU G AUGCCCCC	995	GGGGGCAU UGAUG GCAUGCACUAUGC GCG AGGACGCC	2770
340	GUCCUGAU G CCCCCAAG	996	CUUGGGGG UGAUG GCAUGCACUAUGC GCG AUCAGGAC	2771
360	CCUCUCCU G AGAAGCCA	997	UGGCUUCU UGAUG GCAUGCACUAUGC GCG AGGAGAGG	2772
397	GGGCAGGC G CCAGGGAC	998	GUCCCUGG UGAUG GCAUGCACUAUGC GCG GCCUGCCC	2773
420	GGGCCAGU G CGAGCCCA	999	UGGGCUCG UGAUG GCAUGCACUAUGC GCG ACUGGCCC	2774
422	GCCAGUGC G AGCCCAGA	1000	UCUGGGCU UGAUG GCAUGCACUAUGC GCG GCACUGGC	2775
437	GAGGGCCC G AAGGCCGG	1001	CCGGCCUU UGAUG GCAUGCACUAUGC GCG GGGCCCUC	2776
468	CAAGCCCU G CCCUGGCU	1002	AGCCAGGG UGAUG GCAUGCACUAUGC GCG AGGGCUUG	2777
480	UGGCUCCU G CUGUGGAU	1003	AUCCACAG UGAUG GCAUGCACUAUGC GCG AGGAGCCA	2778
493	GGAUGGGC G CGGGAGUG	1004	CACUCCCG UGAUG GCAUGCACUAUGC GCG GCCCAUCC	2779
501	GCGGGAGU G CUGCCUGC	1005	GCAGGCAG UGAUG GCAUGCACUAUGC GCG ACUCCCGC	2780
504	GGAGUGCU G CCUGCCCA	1006	UGGGCAGG UGAUG GCAUGCACUAUGC GCG AGCACUCC	2781
508	UGCUGCCU G CCCACGGC	1007	GCCGUGGG UGAUG GCAUGCACUAUGC GCG AGGCAGCA	2782
537	AUCCGGCU G CCCCUGCG	1008	CGCAGGGG UGAUG GCAUGCACUAUGC GCG AGCCGGAU	2783
543	CUGCCCCU G CGCAGCGG	1009	CCGCUGCG UGAUG GCAUGCACUAUGC GCG AGGGGCAG	2784
545	GCCCCUGC G CAGCGGCC	1010	GGCCGCUG UGAUG GCAUGCACUAUGC GCG GCAGGGGC	2785
562	UGGGGGGC G CCCCCCUG	1011	CAGGGGGG UGAUG GCAUGCACUAUGC GCG GCCCCCCA	2786
576	CUGGGGCU G CGGCUGCC	1012	GGCAGCCG UGAUG GCAUGCACUAUGC GCG AGCCCCAG	2787
582	CUGCGGCU G CCCCGGGA	1013	UCCCGGGG UGAUG GCAUGCACUAUGC GCG AGCCGCAG	2788
595	GGGAGACC G ACGAAGAG	1014	CUCUUCGU UGAUG GCAUGCACUAUGC GCG GGUCUCCC	2789
598	AGACCGAC G AAGAGCCC	1015	GGGCUCUU UGAUG GCAUGCACUAUGC GCG GUCGGUCU	2790
607	AAGAGCCC G AGGAGCCC	1016	GGGCUCCU UGAUG GCAUGCACUAUGC GCG GGGCUCUU	2791
654	GACAACCU G AGGGGCAA	1017	UUGCCCCU UGAUG GCAUGCACUAUGC GCG AGGUUGUC	2792
690	GUGGAGAU G ACCGUGGG	1018	CCCACGGU UGAUG GCAUGCACUAUGC GCG AUCUCCAC	2793
708	AGCCCCCC G CAGACGCU	1019	AGCGUCUG UGAUG GCAUGCACUAUGC GCG GGGGGGCU	2794
714	CCGCAGAC G CUCAACAU	1020	AUGUUGAG UGAUG GCAUGCACUAUGC GCG GUCUGCGG	2795
751	GUAACUUU G CAGUGGGU	1021	ACCCACUG UGAUG GCAUGCACUAUGC GCG AAAGUUAC	2796
760	CAGUGGGU G CUGCCCCC	1022	GGGGGCAG UGAUG GCAUGCACUAUGC GCG ACCCACUG	2797
763	UGGGUGCU G CCCCCCAC	1023	GUGGGGGG UGAUG GCAUGCACUAUGC GCG AGCACCCA	2798

Table 20

780	CCCUUCCU G CAUCGCUA	1024	UAGCGAUG UGAUG GCAUGCACUAUGC GCG AGGAAGGG	2799
785	CCUGCAUC G CUACUACC	1025	GGUAGUAG UGAUG GCAUGCACUAUGC GCG GAUGCAGG	2800
843	GUGUAUGU G CCCUACAC	1026	GUGUAGGG UGAUG GCAUGCACUAUGC GCG ACAUACAC	2801
883	UGGGCACC G ACCUGGUA	1027	UACCAGGU UGAUG GCAUGCACUAUGC GCG GGUGCCCA	2802
921	GUCACUGU G CGUGCCAA	1028	UUGGCACG UGAUG GCAUGCACUAUGC GCG ACAGUGAC	2803
925	CUGUGCGU G CCAACAUU	1029	AAUGUUGG UGAUG GCAUGCACUAUGC GCG ACGCACAG	2804
934	CCAACAUU G CUGCCAUC	1030	GAUGGCAG UGAUG GCAUGCACUAUGC GCG AAUGUUGG	2805
937	ACAUUGCU G CCAUCACU	1031	AGUGAUGG UGAUG GCAUGCACUAUGC GCG AGCAAUGU	2806
946	CCAUCACU G AAUCAGAC	1032	GUCUGAUU UGAUG GCAUGCACUAUGC GCG AGUGAUGG	2807
1006	UGGCCUAU G CUGAGAUU	1033	AAUCUCAG UGAUG GCAUGCACUAUGC GCG AUAGGCCA	2808
1009	CCUAUGCU G AGAUUGCC	1034	GGCAAUCU UGAUG GCAUGCACUAUGC GCG AGCAUAGG	2809
1015	CUGAGAUU G CCAGGCCU	1035	AGGCCUGG UGAUG GCAUGCACUAUGC GCG AAUCUCAG	2810
1024	CCAGGCCU G ACGACUCC	1036	GGAGUCGU UGAUG GCAUGCACUAUGC GCG AGGCCUGG	2811
1027	GGCCUGAC G ACUCCCUG	1037	CAGGGAGU UGAUG GCAUGCACUAUGC GCG GUCAGGCC	2812
1048	CUUUCUUU G ACUCUCUG	1038	CAGAGAGU UGAUG GCAUGCACUAUGC GCG AAAGAAAG	2813
1092	UUCUCCCU G CAGCUUUG	1039	CAAAGCUG UGAUG GCAUGCACUAUGC GCG AGGGAGAA	2814
1105	UUUGUGGU G CUGGCUUC	1040	GAAGCCAG UGAUG GCAUGCACUAUGC GCG ACCACAAA	2815
1129	ACCAGUCU G AAGUGCUG	1041	CAGCACUU UGAUG GCAUGCACUAUGC GCG AGACUGGU	2816
1134	UCUGAAGU G CUGGCCUC	1042	GAGGCCAG UGAUG GCAUGCACUAUGC GCG ACUUCAGA	2817
1158	GGGAGCAU G AUCAUUGG	1043	CCAAUGAU UGAUG GCAUGCACUAUGC GCG AUGCUCCC	2818
1174	GAGGUAUC G ACCACUCG	1044	CGAGUGGU UGAUG GCAUGCACUAUGC GCG GAUACCUC	2819
1182	GACCACUC G CUGUACAC	1045	GUGUACAG UGAUG GCAUGCACUAUGC GCG GAGUGGUC	2820
1234	GGUAUUAU G AGGUGAUC	1046	GAUCACCU UGAUG GCAUGCACUAUGC GCG AUAAUACC	2821
1239	UAUGAGGU G AUCAUUGU	1047	ACAAUGAU UGAUG GCAUGCACUAUGC GCG ACCUCAUA	2822
1248	AUCAUUGU G CGGGUGGA	1048	UCCACCCG UGAUG GCAUGCACUAUGC GCG ACAAUGAU	2823
1275	CAGGAUCU G AAAAUGGA	1049	UCCAUUUU UGAUG GCAUGCACUAUGC GCG AGAUCCUG	2824
1286	AAUGGACU G CAAGGAGU	1050	ACUCCUUG UGAUG GCAUGCACUAUGC GCG AGUCCAUU	2825
1303	ACAACUAU G ACAAGAGC	1051	GCUCUUGU UGAUG GCAUGCACUAUGC GCG AUAGUUGU	2826
1344	CUUCGUUU G CCCAAGAA	1052	UUCUUGGG UGAUG GCAUGCACUAUGC GCG AAACGAAG	2827
1360	AAGUGUUU G AAGCUGCA	1053	UGCAGCUU UGAUG GCAUGCACUAUGC GCG AAACACUU	2828
1366	UUGAAGCU G CAGUCAAA	1054	UUUGACUG UGAUG GCAUGCACUAUGC GCG AGCUUCAA	2829
1411	AGUUCCCU G AUGGUUUC	1055	GAAACCAU UGAUG GCAUGCACUAUGC GCG AGGGAACU	2830
1442	GCUGGUGU G CUGGCAAG	1056	CUUGCCAG UGAUG GCAUGCACUAUGC GCG ACACCAGC	2831
1504	UAAUGGGU G AGGUUACC	1057	GGUAACCU UGAUG GCAUGCACUAUGC GCG ACCCAUUA	2832

Table 20

1526	GUCCUUCC G CAUCACCA	1058	UGGUGAUG UGAUG GCAUGCACUAUGC GCG GGAAGGAC	2833
1542	AUCCUUCC G CAGCAAUA	1059	UAUUGCUG UGAUG GCAUGCACUAUGC GCG GGAAGGAU	2834
1554	CAAUACCU G CGGCCAGU	1060	ACUGGCCG UGAUG GCAUGCACUAUGC GCG AGGUAUUG	2835
1588	CCCAAGAC G ACUGUUAC	1061	GUAACAGU UGAUG GCAUGCACUAUGC GCG GUCUUGGG	2836
1603	ACAAGUUU G CCAUCUCA	1062	UGAGAUGG UGAUG GCAUGCACUAUGC GCG AAACUUGU	2837
1672	UUGUCUUU G AUCGGGCC	1063	GGCCCGAU UGAUG GCAUGCACUAUGC GCG AAAGACAA	2838
1682	UCGGGCCC G AAAACGAA	1064	UUCGUUUU UGAUG GCAUGCACUAUGC GCG GGGCCCGA	2839
1688	CCGAAAAC G AAUUGGCU	1065	AGCCAAUU UGAUG GCAUGCACUAUGC GCG GUUUUCGG	2840
1699	UUGGCUUU G CUGUCAGC	1066	GCUGACAG UGAUG GCAUGCACUAUGC GCG AAAGCCAA	2841
1708	CUGUCAGC G CUUGCCAU	1067	AUGGCAAG UGAUG GCAUGCACUAUGC GCG GCUGACAG	2842
1712	CAGCGCUU G CCAUGUGC	1068	GCACAUGG UGAUG GCAUGCACUAUGC GCG AAGCGCUG	2843
1719	UGCCAUGU G CACGAUGA	1069	UCAUCGUG UGAUG GCAUGCACUAUGC GCG ACAUGGCA	2844
1723	AUGUGCAC G AUGAGUUC	1070	GAACUCAU UGAUG GCAUGCACUAUGC GCG GUGCACAU	2845
1726	UGCACGAU G AGUUCAGG	1071	CCUGAACU UGAUG GCAUGCACUAUGC GCG AUCGUGCA	2846
1807	AGACAGAU G AGUCAACC	1072	GGUUGACU UGAUG GCAUGCACUAUGC GCG AUCUGUCU	2847
1821	ACCCUCAU G ACCAUAGC	1073	GCUAUGGU UGAUG GCAUGCACUAUGC GCG AUGAGGGU	2848
1843	UCAUGGCU G CCAUCUGC	1074	GCAGAUGG UGAUG GCAUGCACUAUGC GCG AGCCAUGA	2849
1850	UGCCAUCU G CGCCCUCU	1075	AGAGGGCG UGAUG GCAUGCACUAUGC GCG AGAUGGCA	2850
1852	CCAUCUGC G CCCUCUUC	1076	GAAGAGGG UGAUG GCAUGCACUAUGC GCG GCAGAUGG	2851
1863	CUCUUCAU G CUGCCACU	1077	AGUGGCAG UGAUG GCAUGCACUAUGC GCG AUGAAGAG	2852
1866	UUCAUGCU G CCACUCUG	1078	CAGAGUGG UGAUG GCAUGCACUAUGC GCG AGCAUGAA	2853
1874	GCCACUCU G CCUCAUGG	1079	CCAUGAGG UGAUG GCAUGCACUAUGC GCG AGAGUGGC	2854
1895	UCAGUGGC G CUGCCUCC	1080	GGAGGCAG UGAUG GCAUGCACUAUGC GCG GCCACUGA	2855
1898	GUGGCGCU G CCUCCGCU	1081	AGCGGAGG UGAUG GCAUGCACUAUGC GCG AGCGCCAC	2856
1904	CUGCCUCC G CUGCCUGC	1082	GCAGGCAG UGAUG GCAUGCACUAUGC GCG GGAGGCAG	2857
1907	CCUCCGCU G CCUGCGCC	1083	GGCGCAGG UGAUG GCAUGCACUAUGC GCG AGCGGAGG	2858
1911	CGCUGCCU G CGCCAGCA	1084	UGCUGGCG UGAUG GCAUGCACUAUGC GCG AGGCAGCG	2859
1913	CUGCCUGC G CCAGCAGC	1085	GCUGCUGG UGAUG GCAUGCACUAUGC GCG GCAGGCAG	2860
1924	AGCAGCAU G AUGACUUU	1086	AAAGUCAU UGAUG GCAUGCACUAUGC GCG AUGCUGCU	2861
1927	AGCAUGAU G ACUUUGCU	1087	AGCAAAGU UGAUG GCAUGCACUAUGC GCG AUCAUGCU	2862
1933	AUGACUUU G CUGAUGAC	1088	GUCAUCAG UGAUG GCAUGCACUAUGC GCG AAAGUCAU	2863
1936	ACUUUGCU G AUGACAUC	1089	GAUGUCAU UGAUG GCAUGCACUAUGC GCG AGCAAAGU	2864
1939	UUGCUGAU G ACAUCUCC	1090	GGAGAUGU UGAUG GCAUGCACUAUGC GCG AUCAGCAA	2865
1950	AUCUCCCU G CUGAAGUG	1091	CACUUCAG UGAUG GCAUGCACUAUGC GCG AGGGAGAU	2866

Table 20

1953	UCCCUGCU G AAGUGAGG	1092	CCUCACUU UGAUG GCAUGCACUAUGC GCG AGCAGGGA	2867
1958	GCUGAAGU G AGGAGGCC	1093	GGCCUCCU UGAUG GCAUGCACUAUGC GCG ACUUCAGC	2868
2087	CACCAAAU G CCUCUGCC	1094	GGCAGAGG UGAUG GCAUGCACUAUGC GCG AUUUGGUG	2869
2093	AUGCCUCU G CCUUGAUG	1095	CAUCAAGG UGAUG GCAUGCACUAUGC GCG AGAGGCAU	2870
2098	UCUGCCUU G AUGGAGAA	1096	UUCUCCAU UGAUG GCAUGCACUAUGC GCG AAGGCAGA	2871
2179	AGCACUCU G CUGGCGGG	1097	CCCGCCAG UGAUG GCAUGCACUAUGC GCG AGAGUGCU	2872
2227	GAAAUUCU G CUGCUUGA	1098	UCAAGCAG UGAUG GCAUGCACUAUGC GCG AGAAUUUC	2873
2230	AUUCUGCU G CUUGAAAC	1099	GUUUCAAG UGAUG GCAUGCACUAUGC GCG AGCAGAAU	2874
2234	UGCUGCUU G AAACUUCA	1100	UGAAGUUU UGAUG GCAUGCACUAUGC GCG AAGCAGCA	2875
2248	UCAGCCCU G AACCUUUG	1101	CAAAGGUU UGAUG GCAUGCACUAUGC GCG AGGGCUGA	2876
2329	CAUCACAC G CAGGUUAC	1102	GUAACCUG UGAUG GCAUGCACUAUGC GCG GUGUGAUG	2877
2393	GUUUCCCU G CUGGCCAA	1103	UUGGCCAG UGAUG GCAUGCACUAUGC GCG AGGGAAAC	2878
2419	GAGAGGAU G CACAGUUU	1104	AAACUGUG UGAUG GCAUGCACUAUGC GCG AUCCUCUC	2879
2428	CACAGUUU G CUAUUUGC	1105	GCAAAUAG UGAUG GCAUGCACUAUGC GCG AAACUGUG	2880
2435	UGCUAUUU G CUUUAGAG	1106	CUCUAAAG UGAUG GCAUGCACUAUGC GCG AAAUAGCA	2881
2476	ACAUUGGU G CAAAGAUU	1107	AAUCUUUG UGAUG GCAUGCACUAUGC GCG ACCAAUGU	2882
2485	CAAAGAUU G CCUCUUGA	1108	UCAAGAGG UGAUG GCAUGCACUAUGC GCG AAUCUUUG	2883
2492	UGCCUCUU G AAUUAAAA	1109	UUUUAAUU UGAUG GCAUGCACUAUGC GCG AAGAGGCA	2884
219	GUGCCGAU G UAGCGGGC	1110	GCCCGCUA UGAUG GCAUGCACUAUGC GCG AUCGGCAC	2885
483	CUCCUGCU G UGGAUGGG	1111	CCCAUCCA UGAUG GCAUGCACUAUGC GCG AGCAGGAG	2886
634	GCAGCUUU G UGGAGAUG	1112	CAUCUCCA UGAUG GCAUGCACUAUGC GCG AAAGCUGC	2887
804	AGGCAGCU G UCCAGCAC	1113	GUGCUGGA UGAUG GCAUGCACUAUGC GCG AGCUGCCU	2888
835	GGAAGGGU G UGUAUGUG	1114	CACAUACA UGAUG GCAUGCACUAUGC GCG ACCCUUCC	2889
837	AAGGGUGU G UAUGUGCC	1115	GGCACAUA UGAUG GCAUGCACUAUGC GCG ACACCCUU	2890
841	GUGUGUAU G UGCCCUAC	1116	GUAGGGCA UGAUG GCAUGCACUAUGC GCG AUACACAC	2891
919	ACGUCACU G UGCGUGCC	1117	GGCACGCA UGAUG GCAUGCACUAUGC GCG AGUGACGU	2892
1100	GCAGCUUU G UGGUGCUG	1118	CAGCACCA UGAUG GCAUGCACUAUGC GCG AAAGCUGC	2893
1144	UGGCCUCU G UCGGAGGG	1119	CCCUCCGA UGAUG GCAUGCACUAUGC GCG AGAGGCCA	2894
1185	CACUCGCU G UACACAGG	1120	CCUGUGUA UGAUG GCAUGCACUAUGC GCG AGCGAGUG	2895
1246	UGAUCAUU G UGCGGGUG	1121	CACCCGCA UGAUG GCAUGCACUAUGC GCG AAUGAUCA	2896
1315	AGAGCAUU G UGGACAGU	1122	ACUGUCCA UGAUG GCAUGCACUAUGC GCG AAUGCUCU	2897
1356	AAGAAAGU G UUUGAAGC	1123	GCUUCAAA UGAUG GCAUGCACUAUGC GCG ACUUUCUU	2898
1440	CAGCUGGU G UGCUGGCA	1124	UGCCAGCA UGAUG GCAUGCACUAUGC GCG ACCAGCUG	2899
1570	UGGAAGAU G UGGCCACG	1125	CGUGGCCA UGAUG GCAUGCACUAUGC GCG AUCUUCCA	2900

Table 20

1592	AGACGACU G UUACAAGU	1126	ACUUGUAA UGAUG GCAUGCACUAUGC GCG AGUCGUCU	2901
1630	CGGGCACU G UUAUGGGA	1127	UCCCAUAA UGAUG GCAUGCACUAUGC GCG AGUGCCCG	2902
1642	UGGGAGCU G UUAUCAUG	1128	CAUGAUAA UGAUG GCAUGCACUAUGC GCG AGCUCCCA	2903
1666	UCUACGUU G UCUUUGAU	1129	AUCAAAGA UGAUG GCAUGCACUAUGC GCG AACGUAGA	2904
1702	GCUUUGCU G UCAGCGCU	1130	AGCGCUGA UGAUG GCAUGCACUAUGC GCG AGCAAAGC	2905
1717	CUUGCCAU G UGCACGAU	1131	AUCGUGCA UGAUG GCAUGCACUAUGC GCG AUGGCAAG	2906
1759	GCCCUUUU G UCACCUUG	1132	CAAGGUGA UGAUG GCAUGCACUAUGC. GCG AAAAGGGC	2907
1781	GGAAGACU G UGGCUACA	1133	UGUAGCCA UGAUG GCAUGCACUAUGC GCG AGUCUUCC	2908
1834	UAGCCUAU G UCAUGGCU	1134	AGCCAUGA UGAUG GCAUGCACUAUGC GCG AUAGGCUA	2909
1884	CUCAUGGU G UGUCAGUG	1135	CACUGACA UGAUG GCAUGCACUAUGC GCG ACCAUGAG	2910
1886	CAUGGUGU G UCAGUGGC	1136	GCCACUGA UGAUG GCAUGCACUAUGC GCG ACACCAUG	2911
2048	UGGCACCU G UGGCCAGA	1137	UCUGGCCA UGAUG GCAUGCACUAUGC GCG AGGUGCCA	2912
2139	CAGGGACU G UACCUGUA	1138	UACAGGUA UGAUG GCAUGCACUAUGC GCG AGUCCCUG	2913
2145	CUGUACCU G UAGGAAAC	1139	GUUUCCUA UGAUG GCAUGCACUAUGC GCG AGGUACAG	2914
2256	GAACCUUU G UCCACCAU	1140	AUGGUGGA UGAUG GCAUGCACUAUGC GCG AAAGGUUC	2915
2346	CUUGGCGU G UGUCCCUG	1141	CAGGGACA UGAUG GCAUGCACUAUGC GCG ACGCCAAG	2916
2348	UGGCGUGU G UCCCUGUG	1142	CACAGGGA UGAUG GCAUGCACUAUGC GCG ACACGCCA	2917
2354	GUGUCCCU G UGGUACCC	1143	GGGUACCA UGAUG GCAUGCACUAUGC GCG AGGGACAC	2918
2385	CCAAGCUU G UUUCCCUG	1144	CAGGGAAA UGAUG GCAUGCACUAUGC GCG AAGCUUGG	2919
2453	CAGGGACU G UAUAAACA	1145	UGUUUAUA UGAUG GCAUGCACUAUGC GCG AGUCCCUG	2920

Input Sequence = AF190725. Cut Site = G/.
Stem Length = 8. Core Sequence = UGAUG GCAUGCACUAUGC GCG
AF190725 (Homo sapiens beta-site APP cleaving enzyme (BACE) mRNA; 2526 bp)

Table 21

Table 21: Human BACE Zinzyme Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
11	ACGCGUCC G CAGCCCGC	960	GCGGGCUG GCCGAAAGGCGAGUCAAGGUCU GGACGCGU	2921
18	CGCAGCCC G CCCGGGAG	961	CUCCCGGG GCCGAAAGGCGAGUCAAGGUCU GGGCUGCG	2922
29	CGGGAGCU G CGAGCCGC	962	GCGGCUCG GCCGAAAGGCGAGUCAAGGUCU AGCUCCCG	2923
36	UGCGAGCC G CGAGCUGG	964	CCAGCUCG GCCGAAAGGCGAGUCAAGGUCU GGCUCGCA	2924
69	CAGCCAAC G CAGCCGCA	967	UGCGGCUG GCCGAAAGGCGAGUCAAGGUCU GUUGGCUG	2925
75	ACGCAGCC G CAGGAGCC	968	GGCUCCUG GCCGAAAGGCGAGUCAAGGUCU GGCUGCGU	2926
94	GAGCCCUU G CCCCUGCC	969	GGCAGGGG GCCGAAAGGCGAGUCAAGGUCU AAGGGCUC	2927
100	UUGCCCCU G CCCGCGCC	970	GGCGCGGG GCCGAAAGGCGAGUCAAGGUCU AGGGGCAA	2928
104	CCCUGCCC G CGCCGCCG	971	CGGCGGCG GCCGAAAGGCGAGUCAAGGUCU GGGCAGGG	2929
106	CUGCCCGC G CCGCCGCC	972	GGCGGCGG GCCGAAAGGCGAGUCAAGGUCU GCGGGCAG	2930
109	CCCGCGCC G CCGCCCGC	973	GCGGGCGG GCCGAAAGGCGAGUCAAGGUCU GGCGCGGG	2931
112	GCGCCGCC G CCCGCCGG	974	CCGGCGGG GCCGAAAGGCGAGUCAAGGUCU GGCGGCGC	2932
116	CGCCGCCC G CCGGGGGG	975	CCCCCCGG GCCGAAAGGCGAGUCAAGGUCU GGGCGGCG	2933
137	GGGAAGCC G CCACCGGC	976	GCCGGUGG GCCGAAAGGCGAGUCAAGGUCU GGCUUCCC	2934
148	ACCGGCCC G CCAUGCCC	977	GGGCAUGG GCCGAAAGGCGAGUCAAGGUCU GGGCCGGU	2935
153	CCCGCCAU G CCCGCCCC	978	GGGGCGGG GCCGAAAGGCGAGUCAAGGUCU AUGGCGGG	2936
157	CCAUGCCC G CCCCUCCC	979	GGGAGGGG GCCGAAAGGCGAGUCAAGGUCU GGGCAUGG	2937
172	CCAGCCCC G CCGGGAGC	980	GCUCCCGG GCCGAAAGGCGAGUCAAGGUCU GGGGCUGG	2938
183	GGGAGCCC G CGCCCGCU	981	AGCGGGCG GCCGAAAGGCGAGUCAAGGUCU GGGCUCCC	2939
185	GAGCCCGC G CCCGCUGC	982	GCAGCGGG GCCGAAAGGCGAGUCAAGGUCU GCGGGCUC	2940
189	CCGCGCCC G CUGCCCAG	983	CUGGGCAG GCCGAAAGGCGAGUCAAGGUCU GGGCGCGG	2941
192	CGCCCGCU G CCCAGGCU	984	AGCCUGGG GCCGAAAGGCGAGUCAAGGUCU AGCGGGCG	2942
205	GGCUGGCC G CCGCCGUG	985	CACGGCGG GCCGAAAGGCGAGUCAAGGUCU GGCCAGCC	2943
208	UGGCCGCC G CCGUGCCG	986	CGGCACGG GCCGAAAGGCGAGUCAAGGUCU GGCGGCCA	2944
213	GCCGCCGU G CCGAUGUA	987	UACAUCGG GCCGAAAGGCGAGUCAAGGUCU ACGGCGGC	2945
250	UCUCCCCU G CUCCCGUG	989	CACGGGAG GCCGAAAGGCGAGUCAAGGUCU AGGGGAGA	2946
258	GCUCCCGU G CUCUGCGG	990	CCGCAGAG GCCGAAAGGCGAGUCAAGGUCU ACGGGAGC	2947
263	CGUGCUCU G CGGAUCUC	991	GAGAUCCG GCCGAAAGGCGAGUCAAGGUCU AGAGCACG	2948
280	CCCUGACC G CUCUCCAC	993	GUGGAGAG GCCGAAAGGCGAGUCAAGGUCU GGUCAGGG	2949
320	AGGGCCCU G CAGGCCCU	994	AGGGCCUG GCCGAAAGGCGAGUCAAGGUCU AGGGCCCU	2950
340	GUCCUGAU G CCCCCAAG	996	CUUGGGGG GCCGAAAGGCGAGUCAAGGUCU AUCAGGAC	2951
397	GGGCAGGC G CCAGGGAC	998	GUCCCUGG GCCGAAAGGCGAGUCAAGGUCU GCCUGCCC	2952
420	GGGCCAGU G CGAGCCCA	999	UGGGCUCG GCCGAAAGGCGAGUCAAGGUCU ACUGGCCC	2953
468	CAAGCCCU G CCCUGGCU	1002	AGCCAGGG GCCGAAAGGCGAGUCAAGGUCU AGGGCUUG	2954
480	UGGCUCCU G CUGUGGAU	1003	AUCCACAG GCCGAAAGGCGAGUCAAGGUCU AGGAGCCA	2955
493	GGAUGGGC G CGGGAGUG	1004	CACUCCCG GCCGAAAGGCGAGUCAAGGUCU GCCCAUCC	2956
501	GCGGGAGU G CUGCCUGC	1005	GCAGGCAG GCCGAAAGGCGAGUCAAGGUCU ACUCCCGC	2957
504	GGAGUGCU G CCUGCCCA	1006	UGGGCAGG GCCGAAAGGCGAGUCAAGGUCU AGCACUCC	2958
508	UGCUGCCU G CCCACGGC	1007	GCCGUGGG GCCGAAAGGCGAGUCAAGGUCU AGGCAGCA	2959
537	AUCCGGCU G CCCCUGCG	1008	CGCAGGGG GCCGAAAGGCGAGUCAAGGUCU AGCCGGAU	2960
543	CUGCCCCU G CGCAGCGG	1009	CCGCUGCG GCCGAAAGGCGAGUCAAGGUCU AGGGGCAG	2961
545	GCCCCUGC G CAGCGGCC	1010	GGCCGCUG GCCGAAAGGCGAGUCAAGGUCU GCAGGGGC	2962
562	UGGGGGGC G CCCCCCUG	1011	CAGGGGGG GCCGAAAGGCGAGUCAAGGUCU GCCCCCCA	2963
576	CUGGGGCU G CGGCUGCC	1012	GGCAGCCG GCCGAAAGGCGAGUCAAGGUCU AGCCCCAG	2964
582	CUGCGGCU G CCCCGGGA	1013	UCCCGGGG GCCGAAAGGCGAGUCAAGGUCU AGCCGCAG	2965
708	AGCCCCCC G CAGACGCU	1019	AGCGUCUG GCCGAAAGGCGAGUCAAGGUCU GGGGGGCU	2966
714	CCGCAGAC G CUCAACAU	1020	AUGUUGAG GCCGAAAGGCGAGUCAAGGUCU GUCUGCGG	2967

Table 21

751	GUAACUUU G CAGUGGGU	1021	ACCCACUG GCCGAAAGGCGAGUCAAGGUCU AAAGUUAC	2968
760	CAGUGGGU G CUGCCCCC	1022	GGGGGCAG GCCGAAAGGCGAGUCAAGGUCU ACCCACUG	2969
763	UGGGUGCU G CCCCCCAC	1023	GUGGGGGG GCCGAAAGGCGAGUCAAGGUCU AGCACCCA	2970
780	CCCUUCCU G CAUCGCUA	1024	UAGCGAUG GCCGAAAGGCGAGUCAAGGUCU AGGAAGGG	2971
785	CCUGCAUC G CUACUACC	1025	GGUAGUAG GCCGAAAGGCGAGUCAAGGUCU GAUGCAGG	2972
843	GUGUAUGU G CCCUACAC	1026	GUGUAGGG GCCGAAAGGCGAGUCAAGGUCU ACAUACAC	2973
921	GUCACUGU G CGUGCCAA	1028	UUGGCACG GCCGAAAGGCGAGUCAAGGUCU ACAGUGAC	2974
925	CUGUGCGU G CCAACAUU	1029	AAUGUUGG GCCGAAAGGCGAGUCAAGGUCU ACGCACAG	2975
934	CCAACAUU G CUGCCAUC	1030	GAUGGCAG GCCGAAAGGCGAGUCAAGGUCU AAUGUUGG	2976
937	ACAUUGCU G CCAUCACU	1031	AGUGAUGG GCCGAAAGGCGAGUCAAGGUCU AGCAAUGU	2977
1006	UGGCCUAU G CUGAGAUU	1033	AAUCUCAG GCCGAAAGGCGAGUCAAGGUCU AUAGGCCA	2978
1015	CUGAGAUU G CCAGGCCU	1035	AGGCCUGG GCCGAAAGGCGAGUCAAGGUCU AAUCUCAG	2979
1092	UUCUCCCU G CAGCUUUG	1039	CAAAGCUG GCCGAAAGGCGAGUCAAGGUCU AGGGAGAA	2980
1105	UUUGUGGU G CUGGCUUC	1040	GAAGCCAG GCCGAAAGGCGAGUCAAGGUCU ACCACAAA	2981
1134	UCUGAAGU G CUGGCCUC	1042	GAGGCCAG GCCGAAAGGCGAGUCAAGGUCU ACUUCAGA	2982
1182	GACCACUC G CUGUACAC	1045	GUGUACAG GCCGAAAGGCGAGUCAAGGUCU GAGUGGUC	2983
1248	AUCAUUGU G CGGGUGGA	1048	UCCACCCG GCCGAAAGGCGAGUCAAGGUCU ACAAUGAU	2984
1286	AAUGGACU G CAAGGAGU	1050	ACUCCUUG GCCGAAAGGCGAGUCAAGGUCU AGUCCAUU	2985
1344	CUUCGUUU G CCCAAGAA	1052	UUCUUGGG GCCGAAAGGCGAGUCAAGGUCU AAACGAAG	2986
1366	UUGAAGCU G CAGUCAAA	1054	UUUGACUG GCCGAAAGGCGAGUCAAGGUCU AGCUUCAA	2987
1442	GCUGGUGU G CUGGCAAG	1056	CUUGCCAG GCCGAAAGGCGAGUCAAGGUCU ACACCAGC	2988
1526	GUCCUUCC G CAUCACCA	1058	UGGUGAUG GCCGAAAGGCGAGUCAAGGUCU GGAAGGAC	2989
1542	AUCCUUCC G CAGCAAUA	1059	UAUUGCUG GCCGAAAGGCGAGUCAAGGUCU GGAAGGAU	2990
1554	CAAUACCU G CGGCCAGU	1060	ACUGGCCG GCCGAAAGGCGAGUCAAGGUCU AGGUAUUG	2991
1603	ACAAGUUU G CCAUCUCA	1062	UGAGAUGG GCCGAAAGGCGAGUCAAGGUCU AAACUUGU	2992
1699	UUGGCUUU G CUGUCAGC	1066	GCUGACAG GCCGAAAGGCGAGUCAAGGUCU AAAGCCAA	2993
1708	CUGUCAGC G CUUGCCAU	1067	AUGGCAAG GCCGAAAGGCGAGUCAAGGUCU GCUGACAG	2994
1712	CAGCGCUU G CCAUGUGC	1068	GCACAUGG GCCGAAAGGCGAGUCAAGGUCU AAGCGCUG	2995
1719	UGCCAUGU G CACGAUGA	1069	UCAUCGUG GCCGAAAGGCGAGUCAAGGUCU ACAUGGCA	2996
1843	UCAUGGCU G CCAUCUGC	1074	GCAGAUGG GCCGAAAGGCGAGUCAAGGUCU AGCCAUGA	2997
1850	UGCCAUCU G CGCCCUCU	1075	AGAGGGCG GCCGAAAGGCGAGUCAAGGUCU AGAUGGCA	2998
1852	CCAUCUGC G CCCUCUUC	1076	GAAGAGGG GCCGAAAGGCGAGUCAAGGUCU GCAGAUGG	2999
1863	CUCUUCAU G CUGCCACU	1077	AGUGGCAG GCCGAAAGGCGAGUCAAGGUCU AUGAAGAG	3000
1866	UUCAUGCU G CCACUCUG	1078	CAGAGUGG GCCGAAAGGCGAGUCAAGGUCU AGCAUGAA	3001
1874	GCCACUCU G CCUCAUGG	1079	CCAUGAGG GCCGAAAGGCGAGUCAAGGUCU AGAGUGGC	3002
1895	UCAGUGGC G CUGCCUCC	1080	GGAGGCAG GCCGAAAGGCGAGUCAAGGUCU GCCACUGA	3003
1898	GUGGCGCU G CCUCCGCU	1081	AGCGGAGG GCCGAAAGGCGAGUCAAGGUCU AGCGCCAC	3004
1904	CUGCCUCC G CUGCCUGC	1082	GCAGGCAG GCCGAAAGGCGAGUCAAGGUCU GGAGGCAG	3005
1907	CCUCCGCU G CCUGCGCC	1083	GGCGCAGG GCCGAAAGGCGAGUCAAGGUCU AGCGGAGG	3006
1911	CGCUGCCU G CGCCAGCA	1084	UGCUGGCG GCCGAAAGGCGAGUCAAGGUCU AGGCAGCG	3007
1913	CUGCCUGC G CCAGCAGC	1085	GCUGCUGG GCCGAAAGGCGAGUCAAGGUCU GCAGGCAG	3008
1933	AUGACUUU G CUGAUGAC	1088	GUCAUCAG GCCGAAAGGCGAGUCAAGGUCU AAAGUCAU	3009
1950	AUCUCCCU G CUGAAGUG	1091	CACUUCAG GCCGAAAGGCGAGUCAAGGUCU AGGGAGAU	3010
2087	CACCAAAU G CCUCUGCC	1094	GGCAGAGG GCCGAAAGGCGAGUCAAGGUCU AUUUGGUG	3011
2093	AUGCCUCU G CCUUGAUG	1095	CAUCAAGG GCCGAAAGGCGAGUCAAGGUCU AGAGGCAU	3012
2179	AGCACUCU G CUGGCGGG	1097	CCCGCCAG GCCGAAAGGCGAGUCAAGGUCU AGAGUGCU	3013
2227	GAAAUUCU G CUGCUUGA	1098	UCAAGCAG GCCGAAAGGCGAGUCAAGGUCU AGAAUUUC	3014
2230	AUUCUGCU G CUUGAAAC	1099	GUUUCAAG GCCGAAAGGCGAGUCAAGGUCU AGCAGAAU	3015
2329	CAUCACAC G CAGGUUAC	1102	GUAACCUG GCCGAAAGGCGAGUCAAGGUCU GUGUGAUG	3016
2393	GUUUCCCU G CUGGCCAA	1103	UUGGCCAG GCCGAAAGGCGAGUCAAGGUCU AGGGAAAC	3017
2419	GAGAGGAU G CACAGUUU	1104	AAACUGUG GCCGAAAGGCGAGUCAAGGUCU AUCCUCUC	3018

Table 21

2428	CACAGUUU G CUAUUUGC	1105	GCAAAUAG GCCGAAAGGCGAGUCAAGGUCU AAACUGUG	3019
2435	UGCUAUUU G CUUUAGAG	1106	CUCUAAAG GCCGAAAGGCGAGUCAAGGUCU AAAUAGCA	3020
2476	ACAUUGGU G CAAAGAUU	1107	AAUCUUUG GCCGAAAGGCGAGUCAAGGUCU ACCAAUGU	3021
2485	CAAAGAUU G CCUCUUGA	1108	UCAAGAGG GCCGAAAGGCGAGUCAAGGUCU AAUCUUUG	3022
219	GUGCCGAU G UAGCGGGC	1110	GCCCGCUA GCCGAAAGGCGAGUCAAGGUCU AUCGGCAC	3023
483	CUCCUGCU G UGGAUGGG	1111	CCCAUCCA GCCGAAAGGCGAGUCAAGGUCU AGCAGGAG	3024
634	GCAGCUUU G UGGAGAUG	1112	CAUCUCCA GCCGAAAGGCGAGUCAAGGUCU AAAGCUGC	3025
804	AGGCAGCU G UCCAGCAC	1113	GUGCUGGA GCCGAAAGGCGAGUCAAGGUCU AGCUGCCU	3026
835	GGAAGGGU G UGUAUGUG	1114	CACAUACA GCCGAAAGGCGAGUCAAGGUCU ACCCUUCC	3027
837	AAGGGUGU G UAUGUGCC	1115	GGCACAUA GCCGAAAGGCGAGUCAAGGUCU ACACCCUU	3028
841	GUGUGUAU G UGCCCUAC	1116	GUAGGGCA GCCGAAAGGCGAGUCAAGGUCU AUACACAC	3029
919	ACGUCACU G UGCGUGCC	1117	GGCACGCA GCCGAAAGGCGAGUCAAGGUCU AGUGACGU	3030
1100	GCAGCUUU G UGGUGCUG	1118	CAGCACCA GCCGAAAGGCGAGUCAAGGUCU AAAGCUGC	3031
1144	UGGCCUCU G UCGGAGGG	1119	CCCUCCGA GCCGAAAGGCGAGUCAAGGUCU AGAGGCCA	3032
1185	CACUCGCU G UACACAGG	1120	CCUGUGUA GCCGAAAGGCGAGUCAAGGUCU AGCGAGUG	3033
1246	UGAUCAUU G UGCGGGUG	1121	CACCCGCA GCCGAAAGGCGAGUCAAGGUCU AAUGAUCA	3034
1315	AGAGCAUU G UGGACAGU	1122	ACUGUCCA GCCGAAAGGCGAGUCAAGGUCU AAUGCUCU	3035
1356	AAGAAAGU G UUUGAAGC	1123	GCUUCAAA GCCGAAAGGCGAGUCAAGGUCU ACUUUCUU	3036
1440	CAGCUGGU G UGCUGGCA	1124	UGCCAGCA GCCGAAAGGCGAGUCAAGGUCU ACCAGCUG	3037
1570	UGGAAGAU G UGGCCACG	1125	CGUGGCCA GCCGAAAGGCGAGUCAAGGUCU AUCUUCCA	3038
1592	AGACGACU G UUACAAGU	1126	ACUUGUAA GCCGAAAGGCGAGUCAAGGUCU AGUCGUCU	3039
1630	CGGGCACU G UUAUGGGA	1127	UCCCAUAA GCCGAAAGGCGAGUCAAGGUCU AGUGCCCG	3040
1642	UGGGAGCU G UUAUCAUG	1128	CAUGAUAA GCCGAAAGGCGAGUCAAGGUCU AGCUCCCA	3041
1666	UCUACGUU G UCUUUGAU	1129	AUCAAAGA GCCGAAAGGCGAGUCAAGGUCU AACGUAGA	3042
1702	GCUUUGCU G UCAGCGCU	1130	AGCGCUGA GCCGAAAGGCGAGUCAAGGUCU AGCAAAGC	3043
1717	CUUGCCAU G UGCACGAU	1131	AUCGUGCA GCCGAAAGGCGAGUCAAGGUCU AUGGCAAG	3044
1759	GCCCUUUU G UCACCUUG	1132	CAAGGUGA GCCGAAAGGCGAGUCAAGGUCU AAAAGGGC	3045
1781	GGAAGACU G UGGCUACA	1133	UGUAGCCA GCCGAAAGGCGAGUCAAGGUCU AGUCUUCC	3046
1834	UAGCCUAU G UCAUGGCU	1134	AGCCAUGA GCCGAAAGGCGAGUCAAGGUCU AUAGGCUA	3047
1884	CUCAUGGU G UGUCAGUG	1135	CACUGACA GCCGAAAGGCGAGUCAAGGUCU ACCAUGAG	3048
1886	CAUGGUGU G UCAGUGGC	1136	GCCACUGA GCCGAAAGGCGAGUCAAGGUCU ACACCAUG	3049
2048	UGGCACCU G UGGCCAGA	1137	UCUGGCCA GCCGAAAGGCGAGUCAAGGUCU AGGUGCCA	3050
2139	CAGGGACU G UACCUGUA	1138	UACAGGUA GCCGAAAGGCGAGUCAAGGUCU AGUCCCUG	3051
2145	CUGUACCU G UAGGAAAC	1139	GUUUCCUA GCCGAAAGGCGAGUCAAGGUCU AGGUACAG	3052
2256	GAACCUUU G UCCACCAU	1140	AUGGUGGA GCCGAAAGGCGAGUCAAGGUCU AAAGGUUC	3053
2346	CUUGGCGU G UGUCCCUG	1141	CAGGGACA GCCGAAAGGCGAGUCAAGGUCU ACGCCAAG	3054
2348	UGGCGUGU G UCCCUGUG	1142	CACAGGGA GCCGAAAGGCGAGUCAAGGUCU ACACGCCA	3055
2354	GUGUCCCU G UGGUACCC	1143	GGGUACCA GCCGAAAGGCGAGUCAAGGUCU AGGGACAC	3056
2385	CCAAGCUU G UUUCCCUG	1144	CAGGGAAA GCCGAAAGGCGAGUCAAGGUCU AAGCUUGG	3057
2453	CAGGGACU G UAUAAACA	1145	UGUUUAUA GCCGAAAGGCGAGUCAAGGUCU AGUCCCUG	3058
14	CGUCCGCA G CCCGCCCG	1146	CGGGCGGG GCCGAAAGGCGAGUCAAGGUCU UGCGGACG	3059
26	GCCCGGGA G CUGCGAGC	1147	GCUCGCAG GCCGAAAGGCGAGUCAAGGUCU UCCCGGGC	3060
33	AGCUGCGA G CCGCGAGC	1148	GCUCGCGG GCCGAAAGGCGAGUCAAGGUCU UCGCAGCU	3061
40	AGCCGCGA G CUGGAUUA	1149	UAAUCCAG GCCGAAAGGCGAGUCAAGGUCU UCGCGGCU	3062
51	GGAUUAUG G UGGCCUGA	1150	UCAGGCCA GCCGAAAGGCGAGUCAAGGUCU CAUAAUCC	3063
54	UUAUGGUG G CCUGAGCA	1151	UGCUCAGG GCCGAAAGGCGAGUCAAGGUCU CACCAUAA	3064
60	UGGCCUGA G CAGCCAAC	1152	GUUGGCUG GCCGAAAGGCGAGUCAAGGUCU UCAGGCCA	3065
63	CCUGAGCA G CCAACGCA	1153	UGCGUUGG GCCGAAAGGCGAGUCAAGGUCU UGCUCAGG	3066
72	CCAACGCA G CCGCAGGA	1154	UCCUGCGG GCCGAAAGGCGAGUCAAGGUCU UGCGUUGG	3067
81	CCGCAGGA G CCCGGAGC	1155	GCUCCGGG GCCGAAAGGCGAGUCAAGGUCU UCCUGCGG	3068
88	AGCCCGGA G CCCUUGCC	1156	GGCAAGGG GCCGAAAGGCGAGUCAAGGUCU UCCGGGCU	3069

Table 21

134	CCAGGGAA G CCGCCACC	1157	GGUGGCGG GCCGAAAGGCGAGUCAAGGUCU UUCCCUGG	3070
144	CGCCACCG G CCCGCCAU	1158	AUGGCGGG GCCGAAAGGCGAGUCAAGGUCU CGGUGGCG	3071
167	CCCUCCCA G CCCCGCCG	1159	CGGCGGGG GCCGAAAGGCGAGUCAAGGUCU UGGGAGGG	3072
179	CGCCGGGA G CCCGCGCC	1160	GGCGCGGG GCCGAAAGGCGAGUCAAGGUCU UCCCGGCG	3073
198	CUGCCCAG G CUGGCCGC	1161	GCGGCCAG GCCGAAAGGCGAGUCAAGGUCU CUGGGCAG	3074
202	CCAGGCUG G CCGCCGCC	1162	GGCGGCGG GCCGAAAGGCGAGUCAAGGUCU CAGCCUGG	3075
211	CCGCCGCC G UGCCGAUG	1163	CAUCGGCA GCCGAAAGGCGAGUCAAGGUCU GGCGGCGG	3076
222	CCGAUGUA G CGGGCUCC	1164	GGAGCCCG GCCGAAAGGCGAGUCAAGGUCU UACAUCGG	3077
226	UGUAGCGG G CUCCGGAU	1165	AUCCGGAG GCCGAAAGGCGAGUCAAGGUCU CCGCUACA	3078
239	GGAUCCCA G CCUCUCCC	1166	GGGAGAGG GCCGAAAGGCGAGUCAAGGUCU UGGGAUCC	3079
256	CUGCUCCC G UGCUCUGC	1167	GCAGAGCA GCCGAAAGGCGAGUCAAGGUCU GGGAGCAG	3080
290	UCUCCACA G CCCGGACC	1168	GGUCCGGG GCCGAAAGGCGAGUCAAGGUCU UGUGGAGA	3081
304	ACCCGGGG G CUGGCCCA	1169	UGGGCCAG GCCGAAAGGCGAGUCAAGGUCU CCCCGGGU	3082
308	GGGGGCUG G CCCAGGGC	1170	GCCCUGGG GCCGAAAGGCGAGUCAAGGUCU CAGCCCCC	3083
315	GGCCCAGG G CCCUGCAG	1171	CUGCAGGG GCCGAAAGGCGAGUCAAGGUCU CCUGGGCC	3084
324	CCCUGCAG G CCCUGGCG	1172	CGCCAGGG GCCGAAAGGCGAGUCAAGGUCU CUGCAGGG	3085
330	AGGCCCUG G CGUCCUGA	1173	UCAGGACG GCCGAAAGGCGAGUCAAGGUCU CAGGGCCU	3086
332	GCCCUGGC G UCCUGAUG	1174	CAUCAGGA GCCGAAAGGCGAGUCAAGGUCU GCCAGGGC	3087
348	GCCCCCAA G CUCCCUCU	1175	AGAGGGAG GCCGAAAGGCGAGUCAAGGUCU UUGGGGGC	3088
365	CCUGAGAA G CCACCAGC	1176	GCUGGUGG GCCGAAAGGCGAGUCAAGGUCU UUCUCAGG	3089
372	AGCCACCA G CACCACCC	1177	GGGUGGUG GCCGAAAGGCGAGUCAAGGUCU UGGUGGCU	3090
391	ACUUGGGG G CAGGCGCC	1178	GGCGCCUG GCCGAAAGGCGAGUCAAGGUCU CCCCAAGU	3091
395	GGGGGCAG G CGCCAGGG	1179	CCCUGGCG GCCGAAAGGCGAGUCAAGGUCU CUGCCCCC	3092
410	GGACGGAC G UGGGCCAG	1180	CUGGCCCA GCCGAAAGGCGAGUCAAGGUCU GUCCGUCC	3093
414	GGACGUGG G CCAGUGCG	1181	CGCACUGG GCCGAAAGGCGAGUCAAGGUCU CCACGUCC	3094
418	GUGGGCCA G UGCGAGCC	1182	GGCUCGCA GCCGAAAGGCGAGUCAAGGUCU UGGCCCAC	3095
424	CAGUGCGA G CCCAGAGG	1183	CCUCUGGG GCCGAAAGGCGAGUCAAGGUCU UCGCACUG	3096
433	CCCAGAGG G CCCGAAGG	1184	CCUUCGGG GCCGAAAGGCGAGUCAAGGUCU CCUCUGGG	3097
441	GCCCGAAG G CCGGGGCC	1185	GGCCCCGG GCCGAAAGGCGAGUCAAGGUCU CUUCGGGC	3098
447	AGGCCGGG G CCCACCAU	1186	AUGGUGGG GCCGAAAGGCGAGUCAAGGUCU CCCGGCCU	3099
457	CCACCAUG G CCCAAGCC	1187	GGCUUGGG GCCGAAAGGCGAGUCAAGGUCU CAUGGUGG	3100
463	UGGCCCAA G CCCUGCCC	1188	GGGCAGGG GCCGAAAGGCGAGUCAAGGUCU UUGGGCCA	3101
474	CUGCCCUG G CUCCUGCU	1189	AGCAGGAG GCCGAAAGGCGAGUCAAGGUCU CAGGGCAG	3102
491	GUGGAUGG G CGCGGGAG	1190	CUCCCGCG GCCGAAAGGCGAGUCAAGGUCU CCAUCCAC	3103
499	GCGCGGGA G UGCUGCCU	1191	AGGCAGCA GCCGAAAGGCGAGUCAAGGUCU UCCCGCGC	3104
515	UGCCCACG G CACCCAGC	1192	GCUGGGUG GCCGAAAGGCGAGUCAAGGUCU CGUGGGCA	3105
522	GGCACCCA G CACGGCAU	1193	AUGCCGUG GCCGAAAGGCGAGUCAAGGUCU UGGGUGCC	3106
527	CCAGCACG G CAUCCGGC	1194	GCCGGAUG GCCGAAAGGCGAGUCAAGGUCU CGUGCUGG	3107
534	GGCAUCCG G CUGCCCCU	1195	AGGGGCAG GCCGAAAGGCGAGUCAAGGUCU CGGAUGCC	3108
548	CCUGCGCA G CGGCCUGG	1196	CCAGGCCG GCCGAAAGGCGAGUCAAGGUCU UGCGCAGG	3109
551	GCGCAGCG G CCUGGGGG	1197	CCCCCAGG GCCGAAAGGCGAGUCAAGGUCU CGCUGCGC	3110
560	CCUGGGGG G CGCCCCCC	1198	GGGGGGCG GCCGAAAGGCGAGUCAAGGUCU CCCCCAGG	3111
573	CCCCUGGG G CUGCGGCU	1199	AGCCGCAG GCCGAAAGGCGAGUCAAGGUCU CCCAGGGG	3112
579	GGGCUGCG G CUGCCCCG	1200	CGGGGCAG GCCGAAAGGCGAGUCAAGGUCU CGCAGCCC	3113
603	GACGAAGA G CCCGAGGA	1201	UCCUCGGG GCCGAAAGGCGAGUCAAGGUCU UCUUCGUC	3114
612	CCCGAGGA G CCCGGCCG	1202	CGGCCGGG GCCGAAAGGCGAGUCAAGGUCU UCCUCGGG	3115
617	GGAGCCCG G CCGGAGGG	1203	CCCUCCGG GCCGAAAGGCGAGUCAAGGUCU CGGGCUCC	3116
626	CCGGAGGG G CAGCUUUG	1204	CAAAGCUG GCCGAAAGGCGAGUCAAGGUCU CCCUCCGG	3117
629	GAGGGGCA G CUUUGUGG	1205	CCACAAAG GCCGAAAGGCGAGUCAAGGUCU UGCCCCUC	3118
643	UGGAGAUG G UGGACAAC	1206	GUUGUCCA GCCGAAAGGCGAGUCAAGGUCU CAUCUCCA	3119
659	CCUGAGGG G CAAGUCGG	1207	CCGACUUG GCCGAAAGGCGAGUCAAGGUCU CCCUCAGG	3120

Table 21

663	AGGGGCAA G UCGGGGCA	1208	UGCCCCGA GCCGAAAGGCGAGUCAAGGUCU UUGCCCCU	3121
669	AAGUCGGG G CAGGGCUA	1209	UAGCCCUG GCCGAAAGGCGAGUCAAGGUCU CCCGACUU	3122
674	GGGGCAGG G CUACUACG	1210	CGUAGUAG GCCGAAAGGCGAGUCAAGGUCU CCUGCCCC	3123
682	GCUACUAC G UGGAGAUG	1211	CAUCUCCA GCCGAAAGGCGAGUCAAGGUCU GUAGUAGC	3124
694	AGAUGACC G UGGCAGC	1212	GCUGCCCA GCCGAAAGGCGAGUCAAGGUCU GGUCAUCU	3125
698	GACCGUGG G CAGCCCCC	1213	GGGGGCUG GCCGAAAGGCGAGUCAAGGUCU CCACGGUC	3126
701	CGUGGGCA G CCCCCCGC	1214	GCGGGGGG GCCGAAAGGCGAGUCAAGGUCU UGCCCACG	3127
727	ACAUCCUG G UGGAUACA	1215	UGUAUCCA GCCGAAAGGCGAGUCAAGGUCU CAGGAUGU	3128
737	GGAUACAG G CAGCAGUA	1216	UACUGCUG GCCGAAAGGCGAGUCAAGGUCU CUGUAUCC	3129
740	UACAGGCA G CAGUAACU	1217	AGUUACUG GCCGAAAGGCGAGUCAAGGUCU UGCCUGUA	3130
743	AGGCAGCA G UAACUUUG	1218	CAAAGUUA GCCGAAAGGCGAGUCAAGGUCU UGCUGCCU	3131
754	ACUUUGCA G UGGGUGCU	1219	AGCACCCA GCCGAAAGGCGAGUCAAGGUCU UGCAAAGU	3132
758	UGCAGUGG G UGCUGCCC	1220	GGGCAGCA GCCGAAAGGCGAGUCAAGGUCU CCACUGCA	3133
798	UACCAGAG G CAGCUGUC	1221	GACAGCUG GCCGAAAGGCGAGUCAAGGUCU CUCUGGUA	3134
801	CAGAGGCA G CUGUCCAG	1222	CUGGACAG GCCGAAAGGCGAGUCAAGGUCU UGCCUCUG	3135
809	GCUGUCCA G CACAUACC	1223	GGUAUGUG GCCGAAAGGCGAGUCAAGGUCU UGGACAGC	3136
833	CCGGAAGG G UGUGUAUG	1224	CAUACACA GCCGAAAGGCGAGUCAAGGUCU CCUUCCGG	3137
857	CACCCAGG G CAAGUGGG	1225	CCCACUUG GCCGAAAGGCGAGUCAAGGUCU CCUGGGUG	3138
861	CAGGGCAA G UGGGAAGG	1226	CCUUCCCA GCCGAAAGGCGAGUCAAGGUCU UUGCCCUG	3139
873	GAAGGGGA G CUGGGCAC	1227	GUGCCCAG GCCGAAAGGCGAGUCAAGGUCU UCCCCUUC	3140
878	GGAGCUGG G CACCGACC	1228	GGUCGGUG GCCGAAAGGCGAGUCAAGGUCU CCAGCUCC	3141
889	CCGACCUG G UAAGCAUC	1229	GAUGCUUA GCCGAAAGGCGAGUCAAGGUCU CAGGUCGG	3142
893	CCUGGUAA G CAUCCCCC	1230	GGGGGAUG GCCGAAAGGCGAGUCAAGGUCU UUACCAGG	3143
905	CCCCCAUG G CCCCAACG	1231	CGUUGGGG GCCGAAAGGCGAGUCAAGGUCU CAUGGGGG	3144
913	GCCCCAAC G UCACUGUG	1232	CACAGUGA GCCGAAAGGCGAGUCAAGGUCU GUUGGGGC	3145
923	CACUGUGC G UGCCAACA	1233	UGUUGGCA GCCGAAAGGCGAGUCAAGGUCU GCACAGUG	3146
957	UCAGACAA G UUCUUCAU	1234	AUGAAGAA GCCGAAAGGCGAGUCAAGGUCU UUGUCUGA	3147
971	CAUCAACG G CUCCAACU	1235	AGUUGGAG GCCGAAAGGCGAGUCAAGGUCU CGUUGAUG	3148
986	CUGGGAAG G CAUCCUGG	1236	CCAGGAUG GCCGAAAGGCGAGUCAAGGUCU CUUCCCAG	3149
996	AUCCUGGG G CUGGCCUA	1237	UAGGCCAG GCCGAAAGGCGAGUCAAGGUCU CCCAGGAU	3150
1000	UGGGGCUG G CCUAUGCU	1238	AGCAUAGG GCCGAAAGGCGAGUCAAGGUCU CAGCCCCA	3151
1020	AUUGCCAG G CCUGACGA	1239	UCGUCAGG GCCGAAAGGCGAGUCAAGGUCU CUGGCAAU	3152
1038	UCCCUGGA G CCUUUCUU	1240	AAGAAAGG GCCGAAAGGCGAGUCAAGGUCU UCCAGGGA	3153
1057	ACUCUCUG G UAAAGCAG	1241	CUGCUUUA GCCGAAAGGCGAGUCAAGGUCU CAGAGAGU	3154
1062	CUGGUAAA G CAGACCCA	1242	UGGGUCUG GCCGAAAGGCGAGUCAAGGUCU UUUACCAG	3155
1072	AGACCCAC G UUCCCAAC	1243	GUUGGGAA GCCGAAAGGCGAGUCAAGGUCU GUGGGUCU	3156
1095	UCCCUGCA G CUUUGUGG	1244	CCACAAAG GCCGAAAGGCGAGUCAAGGUCU UGCAGGGA	3157
1103	GCUUUGUG G UGCUGGCU	1245	AGCCAGCA GCCGAAAGGCGAGUCAAGGUCU CACAAAGC	3158
1109	UGGUGCUG G CUUCCCCC	1246	GGGGGAAG GCCGAAAGGCGAGUCAAGGUCU CAGCACCA	3159
1125	CUCAACCA G UCUGAAGU	1247	ACUUCAGA GCCGAAAGGCGAGUCAAGGUCU UGGUUGAG	3160
1132	AGUCUGAA G UGCUGGCC	1248	GGCCAGCA GCCGAAAGGCGAGUCAAGGUCU UUCAGACU	3161
1138	AAGUGCUG G CCUCUGUC	1249	GACAGAGG GCCGAAAGGCGAGUCAAGGUCU CAGCACUU	3162
1154	CGGAGGGA G CAUGAUCA	1250	UGAUCAUG GCCGAAAGGCGAGUCAAGGUCU UCCCUCCG	3163
1169	CAUUGGAG G UAUCGACC	1251	GGUCGAUA GCCGAAAGGCGAGUCAAGGUCU CUCCAAUG	3164
1193	GUACACAG G CAGUCUCU	1252	AGAGACUG GCCGAAAGGCGAGUCAAGGUCU CUGUGUAC	3165
1196	CACAGGCA G UCUCUGGU	1253	ACCAGAGA GCCGAAAGGCGAGUCAAGGUCU UGCCUGUG	3166
1203	AGUCUCUG G UAUACACC	1254	GGUGUAUA GCCGAAAGGCGAGUCAAGGUCU CAGAGACU	3167
1218	CCCAUCCG G CGGGAGUG	1255	CACUCCCG GCCGAAAGGCGAGUCAAGGUCU CGGAUGGG	3168
1224	CGGCGGGA G UGGUAUUA	1256	UAAUACCA GCCGAAAGGCGAGUCAAGGUCU UCCCGCCG	3169
1227	CGGGAGUG G UAUUAUGA	1257	UCAUAAUA GCCGAAAGGCGAGUCAAGGUCU CACUCCCG	3170
1237	AUUAUGAG G UGAUCAUU	1258	AAUGAUCA GCCGAAAGGCGAGUCAAGGUCU CUCAUAAU	3171

Table 21

1252	UUGUGCGG G UGGAGAUC	1259	GAUCUCCA GCCGAAAGGCGAGUCAAGGUCU CCGCACAA	3172
1293	UGCAAGGA G UACAACUA	1260	UAGUUGUA GCCGAAAGGCGAGUCAAGGUCU UCCUUGCA	3173
1310	UGACAAGA G CAUUGUGG	1261	CCACAAUG GCCGAAAGGCGAGUCAAGGUCU UCUUGUCA	3174
1322	UGUGGACA G UGGCACCA	1262	UGGUGCCA GCCGAAAGGCGAGUCAAGGUCU UGUCCACA	3175
1325	GGACAGUG G CACCACCA	1263	UGGUGGUG GCCGAAAGGCGAGUCAAGGUCU CACUGUCC	3176
1340	CAACCUUC G UUUGCCCA	1264	UGGGCAAA GCCGAAAGGCGAGUCAAGGUCU GAAGGUUG	3177
1354	CCAAGAAA G UGUUUGAA	1265	UUCAAACA GCCGAAAGGCGAGUCAAGGUCU UUUCUUGG	3178
1363	UGUUUGAA G CUGCAGUC	1266	GACUGCAG GCCGAAAGGCGAGUCAAGGUCU UUCAAACA	3179
1369	AAGCUGCA G UCAAAUCC	1267	GGAUUUGA GCCGAAAGGCGAGUCAAGGUCU UGCAGCUU	3180
1384	CCAUCAAG G CAGCCUCC	1268	GGAGGCUG GCCGAAAGGCGAGUCAAGGUCU CUUGAUGG	3181
1387	UCAAGGCA G CCUCCUCC	1269	GGAGGAGG GCCGAAAGGCGAGUCAAGGUCU UGCCUUGA	3182
1404	ACGGAGAA G UUCCCUGA	1270	UCAGGGAA GCCGAAAGGCGAGUCAAGGUCU UUCUCCGU	3183
1415	CCCUGAUG G UUUCUGGC	1271	GCCAGAAA GCCGAAAGGCGAGUCAAGGUCU CAUCAGGG	3184
1422	GGUUUCUG G CUAGGAGA	1272	UCUCCUAG GCCGAAAGGCGAGUCAAGGUCU CAGAAACC	3185
1431	CUAGGAGA G CAGCUGGU	1273	ACCAGCUG GCCGAAAGGCGAGUCAAGGUCU UCUCCUAG	3186
1434	GGAGAGCA G CUGGUGUG	1274	CACACCAG GCCGAAAGGCGAGUCAAGGUCU UGCUCUCC	3187
1438	AGCAGCUG G UGUGCUGG	1275	CCAGCACA GCCGAAAGGCGAGUCAAGGUCU CAGCUGCU	3188
1446	GUGUGCUG G CAAGCAGG	1276	CCUGCUUG GCCGAAAGGCGAGUCAAGGUCU CAGCACAC	3189
1450	GCUGGCAA G CAGGCACC	1277	GGUGCCUG GCCGAAAGGCGAGUCAAGGUCU UUGCCAGC	3190
1454	GCAAGCAG G CACCACCC	1278	GGGUGGUG GCCGAAAGGCGAGUCAAGGUCU CUGCUUGC	3191
1480	UUUUCCCA G UCAUCUCA	1279	UGAGAUGA GCCGAAAGGCGAGUCAAGGUCU UGGGAAAA	3192
1502	CCUAAUGG G UGAGGUUA	1280	UAACCUCA GCCGAAAGGCGAGUCAAGGUCU CCAUUAGG	3193
1507	UGGGUGAG G UUACCAAC	1281	GUUGGUAA GCCGAAAGGCGAGUCAAGGUCU CUCACCCA	3194
1518	ACCAACCA G UCCUUCCG	1282	CGGAAGGA GCCGAAAGGCGAGUCAAGGUCU UGGUUGGU	3195
1545	CUUCCGCA G CAAUACCU	1283	AGGUAUUG GCCGAAAGGCGAGUCAAGGUCU UGCGGAAG	3196
1557	UACCUGCG G CCAGUGGA	1284	UCCACUGG GCCGAAAGGCGAGUCAAGGUCU CGCAGGUA	3197
1561	UGCGGCCA G UGGAAGAU	1285	AUCUUCCA GCCGAAAGGCGAGUCAAGGUCU UGGCCGCA	3198
1573	AAGAUGUG G CCACGUCC	1286	GGACGUGG GCCGAAAGGCGAGUCAAGGUCU CACAUCUU	3199
1578	GUGGCCAC G UCCCAAGA	1287	UCUUGGGA GCCGAAAGGCGAGUCAAGGUCU GUGGCCAC	3200
1599	UGUUACAA G UUUGCCAU	1288	AUGGCAAA GCCGAAAGGCGAGUCAAGGUCU UUGUAACA	3201
1614	AUCUCACA G UCAUCCAC	1289	GUGGAUGA GCCGAAAGGCGAGUCAAGGUCU UGUGAGAU	3202
1625	AUCCACGG G CACUGUUA	1290	UAACAGUG GCCGAAAGGCGAGUCAAGGUCU CCGUGGAU	3203
1639	UUAUGGGA G CUGUUAUC	1291	GAUAACAG GCCGAAAGGCGAGUCAAGGUCU UCCCAUAA	3204
1655	CAUGGAGG G CUUCUACG	1292	CGUAGAAG GCCGAAAGGCGAGUCAAGGUCU CCUCCAUG	3205
1663	GCUUCUAC G UUGUCUUU	1293	AAAGACAA GCCGAAAGGCGAGUCAAGGUCU GUAGAAGC	3206
1678	UUGAUCGG G CCCGAAAA	1294	UUUUCGGG GCCGAAAGGCGAGUCAAGGUCU CCGAUCAA	3207
1694	ACGAAUUG G CUUUGCUG	1295	CAGCAAAG GCCGAAAGGCGAGUCAAGGUCU CAAUUCGU	3208
1706	UGCUGUCA G CGCUUGCC	1296	GGCAAGCG GCCGAAAGGCGAGUCAAGGUCU UGACAGCA	3209
1728	CACGAUGA G UUCAGGAC	1297	GUCCUGAA GCCGAAAGGCGAGUCAAGGUCU UCAUCGUG	3210
1738	UCAGGACG G CAGCGGUG	1298	CACCGCUG GCCGAAAGGCGAGUCAAGGUCU CGUCCUGA	3211
1741	GGACGGCA G CGGUGGAA	1299	UUCCACCG GCCGAAAGGCGAGUCAAGGUCU UGCCGUCC	3212
1744	CGGCAGCG G UGGAAGGC	1300	GCCUUCCA GCCGAAAGGCGAGUCAAGGUCU CGCUGCCG	3213
1751	GGUGGAAG G CCCUUUUG	1301	CAAAAGGG GCCGAAAGGCGAGUCAAGGUCU CUUCCACC	3214
1784	AGACUGUG G CUACAACA	1302	UGUUGUAG GCCGAAAGGCGAGUCAAGGUCU CACAGUCU	3215
1809	ACAGAUGA G UCAACCCU	1303	AGGGUUGA GCCGAAAGGCGAGUCAAGGUCU UCAUCUGU	3216
1828	UGACCAUA G CCUAUGUC	1304	GACAUAGG GCCGAAAGGCGAGUCAAGGUCU UAUGGUCA	3217
1840	AUGUCAUG G CUGCCAUC	1305	GAUGGCAG GCCGAAAGGCGAGUCAAGGUCU CAUGACAU	3218
1882	GCCUCAUG G UGUGUCAG	1306	CUGACACA GCCGAAAGGCGAGUCAAGGUCU CAUGAGGC	3219
1890	GUGUGUCA G UGGCGCUG	1307	CAGCGCCA GCCGAAAGGCGAGUCAAGGUCU UGACACAC	3220
1893	UGUCAGUG G CGCUGCCU	1308	AGGCAGCG GCCGAAAGGCGAGUCAAGGUCU CACUGACA	3221
1917	CUGCGCCA G CAGCAUGA	1309	UCAUGCUG GCCGAAAGGCGAGUCAAGGUCU UGGCGCAG	3222

Table 21

1920	CGCCAGCA G CAUGAUGA	1310	UCAUCAUG GCCGAAAGGCGAGUCAAGGUCU UGCUGGCG	3223
1956	CUGCUGAA G UGAGGAGG	1311	CCUCCUCA GCCGAAAGGCGAGUCAAGGUCU UUCAGCAG	3224
1964	GUGAGGAG G CCCAUGGG	1312	CCCAUGGG GCCGAAAGGCGAGUCAAGGUCU CUCCUCAC	3225
1972	GCCCAUGG G CAGAAGAU	1313	AUCUUCUG GCCGAAAGGCGAGUCAAGGUCU CCAUGGGC	3226
2006	ACACCUCC G UGGUUCAC	1314	GUGAACCA GCCGAAAGGCGAGUCAAGGUCU GGAGGUGU	3227
2009	CCUCCGUG G UUCACUUU	1315	AAAGUGAA GCCGAAAGGCGAGUCAAGGUCU CACGGAGG	3228
2019	UCACUUUG G UCACAAGU	1316	ACUUGUGA GCCGAAAGGCGAGUCAAGGUCU CAAAGUGA	3229
2026	GGUCACAA G UAGGAGAC	1317	GUCUCCUA GCCGAAAGGCGAGUCAAGGUCU UUGUGACC	3230
2042	CACAGAUG G CACCUGUG	1318	CACAGGUG GCCGAAAGGCGAGUCAAGGUCU CAUCUGUG	3231
2051	CACCUGUG G CCAGAGCA	1319	UGCUCUGG GCCGAAAGGCGAGUCAAGGUCU CACAGGUG	3232
2057	UGGCCAGA G CACCUCAG	1320	CUGAGGUG GCCGAAAGGCGAGUCAAGGUCU UCUGGCCA	3233
2114	AGGAAAAG G CUGGCAAG	1321	CUUGCCAG GCCGAAAGGCGAGUCAAGGUCU CUUUUCCU	3234
2118	AAAGGCUG G CAAGGUGG	1322	CCACCUUG GCCGAAAGGCGAGUCAAGGUCU CAGCCUUU	3235
2123	CUGGCAAG G UGGGUUCC	1323	GGAACCCA GCCGAAAGGCGAGUCAAGGUCU CUUGCCAG	3236
2127	CAAGGUGG G UUCCAGGG	1324	CCCUGGAA GCCGAAAGGCGAGUCAAGGUCU CCACCUUG	3237
2172	AGAAAGAA G CACUCUGC	1325	GCAGAGUG GCCGAAAGGCGAGUCAAGGUCU UUCUUUCU	3238
2183	CUCUGCUG G CGGGAAUA	1326	UAUUCCCG GCCGAAAGGCGAGUCAAGGUCU CAGCAGAG	3239
2198	UACUCUUG G UCACCUCA	1327	UGAGGUGA GCCGAAAGGCGAGUCAAGGUCU CAAGAGUA	3240
2214	AAAUUUAA G UCGGGAAA	1328	UUUCCCGA GCCGAAAGGCGAGUCAAGGUCU UUAAAUUU	3241
2243	AAACUUCA G CCCUGAAC	1329	GUUCAGGG GCCGAAAGGCGAGUCAAGGUCU UGAAGUUU	3242
2288	AACCCAAA G UAUUCUUC	1330	GAAGAAUA GCCGAAAGGCGAGUCAAGGUCU UUUGGGUU	3243
2305	UUUUCUUA G UUUCAGAA	1331	UUCUGAAA GCCGAAAGGCGAGUCAAGGUCU UAAGAAAA	3244
2314	UUUCAGAA G UACUGGCA	1332	UGCCAGUA GCCGAAAGGCGAGUCAAGGUCU UUCUGAAA	3245
2320	AAGUACUG G CAUCACAC	1333	GUGUGAUG GCCGAAAGGCGAGUCAAGGUCU CAGUACUU	3246
2333	ACACGCAG G UUACCUUG	1334	CAAGGUAA GCCGAAAGGCGAGUCAAGGUCU CUGCGUGU	3247
2342	UUACCUUG G CGUGUGUC	1335	GACACACG GCCGAAAGGCGAGUCAAGGUCU CAAGGUAA	3248
2344	ACCUUGGC G UGUGUCCC	1336	GGGACACA GCCGAAAGGCGAGUCAAGGUCU GCCAAGGU	3249
2357	UCCCUGUG G UACCCUGG	1337	CCAGGGUA GCCGAAAGGCGAGUCAAGGUCU CACAGGGA	3250
2365	GUACCCUG G CAGAGAAG	1338	CUUCUCUG GCCGAAAGGCGAGUCAAGGUCU CAGGGUAC	3251
2381	GAGACCAA G CUUGUUUC	1339	GAAACAAG GCCGAAAGGCGAGUCAAGGUCU UUGGUCUC	3252
2397	CCCUGCUG G CCAAAGUC	1340	GACUUUGG GCCGAAAGGCGAGUCAAGGUCU CAGCAGGG	3253
2403	UGGCCAAA G UCAGUAGG	1341	CCUACUGA GCCGAAAGGCGAGUCAAGGUCU UUUGGCCA	3254
2407	CAAAGUCA G UAGGAGAG	1342	CUCUCCUA GCCGAAAGGCGAGUCAAGGUCU UGACUUUG	3255
2424	GAUGCACA G UUUGCUAU	1343	AUAGCAAA GCCGAAAGGCGAGUCAAGGUCU UGUGCAUC	3256
2463	AUAAACAA G CCUAACAU	1344	AUGUUAGG GCCGAAAGGCGAGUCAAGGUCU UUGUUUAU	3257
2474	UAACAUUG G UGCAAAGA	1345	UCUUUGCA GCCGAAAGGCGAGUCAAGGUCU CAAUGUUA	3258

Input Sequence = AF190725. Cut Site = G/.
Stem Length = 8 . Core Sequence = GCcgaaagGCGaGuCaaGGuCu
AF190725 (Homo sapiens beta-site APP cleaving enzyme (BACE) mRNA; 2526 bp)

Table 22

Table 22: Human BACE DNAzyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
48	GCUGGAUU A UGGUGGCC	3	GGCCACCA GGCTAGCTACAACGA AATCCAGC	3259
677	GCAGGGCU A CUACGUGG	27	CCACGTAG GGCTAGCTACAACGA AGCCCTGC	3260
680	GGGCUACU A CGUGGAGA	28	TCTCCACG GGCTAGCTACAACGA AGTAGCCC	3261
733	UGGUGGAU A CAGGCAGC	31	GCTGCCTG GGCTAGCTACAACGA ATCCACCA	3262
788	GCAUCGCU A CUACCAGA	38	TCTGGTAG GGCTAGCTACAACGA AGCGATGC	3263
791	UCGCUACU A CCAGAGGC	39	GCCTCTGG GGCTAGCTACAACGA AGTAGCGA	3264
815	CAGCACAU A CCGGGACC	41	GGTCCCGG GGCTAGCTACAACGA ATGTGCTG	3265
839	GGGUGUGU A UGUGCCCU	43	AGGGCACA GGCTAGCTACAACGA ACACACCC	3266
848	UGUGCCCU A CACCCAGG	44	CCTGGGTG GGCTAGCTACAACGA AGGGCACA	3267
1004	GCUGGCCU A UGCUGAGA	58	TCTCAGCA GGCTAGCTACAACGA AGGCCAGC	3268
1171	UUGGAGGU A UCGACCAC	85	GTGGTCGA GGCTAGCTACAACGA ACCTCCAA	3269
1187	CUCGCUGU A CACAGGCA	88	TGCCTGTG GGCTAGCTACAACGA ACAGCGAG	3270
1205	UCUCUGGU A UACACCCA	91	TGGGTGTA GGCTAGCTACAACGA ACCAGAGA	3271
1207	UCUGGUAU A CACCCAUC	92	GATGGGTG GGCTAGCTACAACGA ATACCAGA	3272
1229	GGAGUGGU A UUAUGAGG	94	CCTCATAA GGCTAGCTACAACGA ACCACTCC	3273
1232	GUGGUAUU A UGAGGUGA	96	TCACCTCA GGCTAGCTACAACGA AATACCAC	3274
1295	CAAGGAGU A CAACUAUG	101	CATAGTTG GGCTAGCTACAACGA ACTCCTTG	3275
1301	GUACAACU A UGACAAGA	102	TCTTGTCA GGCTAGCTACAACGA AGTTGTAC	3276
1493	CUCACUCU A CCUAAUGG	130	CCATTAGG GGCTAGCTACAACGA AGAGTGAG	3277
1510	GUGAGGUU A CCAACCAG	133	CTGGTTGG GGCTAGCTACAACGA AACCTCAC	3278
1550	GCAGCAAU A CCUGCGGC	141	GCCGCAGG GGCTAGCTACAACGA ATTGCTGC	3279
1595	CGACUGUU A CAAGUUUG	144	CAAACTTG GGCTAGCTACAACGA AACAGTCG	3280
1633	GCACUGUU A UGGGAGCU	152	AGCTCCCA GGCTAGCTACAACGA AACAGTGC	3281
1645	GAGCUGUU A UCAUGGAG	154	CTCCATGA GGCTAGCTACAACGA AACAGCTC	3282
1661	GGGCUUCU A CGUUGUCU	158	AGACAACG GGCTAGCTACAACGA AGAAGCCC	3283
1787	CUGUGGCU A CAACAUUC	176	GAATGTTG GGCTAGCTACAACGA AGCCACAG	3284
1832	CAUAGCCU A UGUCAUGG	182	CCATGACA GGCTAGCTACAACGA AGGCTATG	3285
2141	GGGACUGU A CCUGUAGG	212	CCTACAGG GGCTAGCTACAACGA ACAGTCCC	3286
2191	GCGGGAAU A CUCUUGGU	215	ACCAAGAG GGCTAGCTACAACGA ATTCCCGC	3287
2290	CCCAAAGU A UUCUUCUU	240	AAGAAGAA GGCTAGCTACAACGA ACTTTGGG	3288
2316	UCAGAAGU A CUGGCAUC	254	GATGCCAG GGCTAGCTACAACGA ACTTCTGA	3289
2336	CGCAGGUU A CCUUGGCG	257	CGCCAAGG GGCTAGCTACAACGA AACCTGCG	3290
2359	CCUGUGGU A CCCUGGCA	260	TGCCAGGG GGCTAGCTACAACGA ACCACAGG	3291
2431	AGUUUGCU A UUUGCUUU	269	AAAGCAAA GGCTAGCTACAACGA AGCAAACT	3292
2455	GGGACUGU A UAAACAAG	275	CTTGTTTA GGCTAGCTACAACGA ACAGTCCC	3293
140	AAGCCGCC A CCGGCCCG	322	CGGGCCGG GGCTAGCTACAACGA GGCGGCTT	3294
151	GGCCCGCC A UGCCCGCC	327	GGCGGGCA GGCTAGCTACAACGA GGCGGGCC	3295
287	CGCUCUCC A CAGCCCGG	380	CCGGGCTG GGCTAGCTACAACGA GGAGAGCG	3296
368	GAGAAGCC A CCAGCACC	412	GGTGCTGG GGCTAGCTACAACGA GGCTTCTC	3297
374	CCACCAGC A CCACCCAG	415	CTGGGTGG GGCTAGCTACAACGA GCTGGTGG	3298
377	CCAGCACC A CCCAGACU	417	AGTCTGGG GGCTAGCTACAACGA GGTGCTGG	3299
451	CGGGGCCC A CCAUGGCC	435	GGCCATGG GGCTAGCTACAACGA GGGCCCCG	3300
454	GGCCCACC A UGGCCCAA	437	TTGGGCCA GGCTAGCTACAACGA GGTGGGCC	3301
512	GCCUGCCC A CGGCACCC	456	GGGTGCCG GGCTAGCTACAACGA GGGCAGGC	3302
517	CCCACGGC A CCCAGCAC	457	GTGCTGGG GGCTAGCTACAACGA GCCGTGGG	3303
524	CACCCAGC A CGGCAUCC	461	GGATGCCG GGCTAGCTACAACGA GCTGGGTG	3304
529	AGCACGGC A UCCGGCUG	462	CAGCCGGA GGCTAGCTACAACGA GCCGTGCT	3305

Table 22

721	CGCUCAAC A UCCUGGUG	508	CACCAGGA GGCTAGCTACAACGA GTTGAGCG	3306
770	UGCCCCCC A CCCCUUCC	522	GGAAGGGG GGCTAGCTACAACGA GGGGGGCA	3307
782	CUUCCUGC A UCGCUACU	529	AGTAGCGA GGCTAGCTACAACGA GCAGGAAG	3308
811	UGUCCAGC A CAUACCGG	538	CCGGTATG GGCTAGCTACAACGA GCTGGACA	3309
813	UCCAGCAC A UACCGGGA	539	TCCCGGTA GGCTAGCTACAACGA GTGCTGGA	3310
850	UGCCCUAC A CCCAGGGC	547	GCCCTGGG GGCTAGCTACAACGA GTAGGGCA	3311
880	AGCUGGGC A CCGACCUG	553	CAGGTCGG GGCTAGCTACAACGA GCCCAGCT	3312
895	UGGUAAGC A UCCCCCAU	557	ATGGGGGA GGCTAGCTACAACGA GCTTACCA	3313
902	CAUCCCCC A UGGCCCCA	562	TGGGGCCA GGCTAGCTACAACGA GGGGGATG	3314
916	CCAACGUC A CUGUGCGU	567	ACGCACAG GGCTAGCTACAACGA GACGTTGG	3315
931	GUGCCAAC A UUGCUGCC	571	GGCAGCAA GGCTAGCTACAACGA GTTGGCAC	3316
940	UUGCUGCC A UCACUGAA	574	TTCAGTGA GGCTAGCTACAACGA GGCAGCAA	3317
943	CUGCCAUC A CUGAAUCA	575	TGATTCAG GGCTAGCTACAACGA GATGGCAG	3318
964	AGUUCUUC A UCAACGGC	580	GCCGTTGA GGCTAGCTACAACGA GAAGAACT	3319
988	GGGAAGGC A UCCUGGGG	586	CCCCAGGA GGCTAGCTACAACGA GCCTTCCC	3320
1070	GCAGACCC A CGUUCCCA	610	TGGGAACG GGCTAGCTACAACGA GGGTCTGC	3321
1156	GAGGGAGC A UGAUCAUU	638	AATGATCA GGCTAGCTACAACGA GCTCCCTC	3322
1162	GCAUGAUC A UUGGAGGU	639	ACCTCCAA GGCTAGCTACAACGA GATCATGC	3323
1178	UAUCGACC A CUCGCUGU	641	ACAGCGAG GGCTAGCTACAACGA GGTCGATA	3324
1189	CGCUGUAC A CAGGCAGU	644	ACTGCCTG GGCTAGCTACAACGA GTACAGCG	3325
1209	UGGUAUAC A CCCAUCCG	649	CGGATGGG GGCTAGCTACAACGA GTATACCA	3326
1213	AUACACCC A UCCGGCGG	652	CCGCCGGA GGCTAGCTACAACGA GGGTGTAT	3327
1243	AGGUGAUC A UUGUGCGG	654	CCGCACAA GGCTAGCTACAACGA GATCACCT	3328
1312	ACAAGAGC A UUGUGGAC	663	GTCCACAA GGCTAGCTACAACGA GCTCTTGT	3329
1327	ACAGUGGC A CCACCAAC	665	GTTGGTGG GGCTAGCTACAACGA GCCACTGT	3330
1330	GUGGCACC A CCAACCUU	667	AAGGTTGG GGCTAGCTACAACGA GGTGCCAC	3331
1378	UCAAAUCC A UCAAGGCA	679	TGCCTTGA GGCTAGCTACAACGA GGATTTGA	3332
1396	CCUCCUCC A CGGAGAAG	687	CTTCTCCG GGCTAGCTACAACGA GGAGGAGG	3333
1456	AAGCAGGC A CCACCCCU	698	AGGGGTGG GGCTAGCTACAACGA GCCTGCTT	3334
1459	CAGGCACC A CCCCUUGG	700	CCAAGGGG GGCTAGCTACAACGA GGTGCCTG	3335
1471	CUUGGAAC A UUUUCCCA	705	TGGGAAAA GGCTAGCTACAACGA GTTCCAAG	3336
1483	UCCCAGUC A UCUCACUC	709	GAGTGAGA GGCTAGCTACAACGA GACTGGGA	3337
1488	GUCAUCUC A CUCUACCU	711	AGGTAGAG GGCTAGCTACAACGA GAGATGAC	3338
1528	CCUUCCGC A UCACCAUC	723	GATGGTGA GGCTAGCTACAACGA GCGGAAGG	3339
1531	UCCGCAUC A CCAUCCUU	724	AAGGATGG GGCTAGCTACAACGA GATGCGGA	3340
1534	GCAUCACC A UCCUUCCG	726	CGGAAGGA GGCTAGCTACAACGA GGTGATGC	3341
1576	AUGUGGCC A CGUCCCAA	737	TTGGGACG GGCTAGCTACAACGA GGCCACAT	3342
1606	AGUUUGCC A UCUCACAG	744	CTGTGAGA GGCTAGCTACAACGA GGCAAACT	3343
1611	GCCAUCUC A CAGUCAUC	746	GATGACTG GGCTAGCTACAACGA GAGATGGC	3344
1617	UCACAGUC A UCCACGGG	748	CCCGTGGA GGCTAGCTACAACGA GACTGTGA	3345
1621	AGUCAUCC A CGGGCACU	750	AGTGCCCG GGCTAGCTACAACGA GGATGACT	3346
1627	CCACGGGC A CUGUUAUG	751	CATAACAG GGCTAGCTACAACGA GCCCGTGG	3347
1648	CUGUUAUC A UGGAGGGC	754	GCCCTCCA GGCTAGCTACAACGA GATAACAG	3348
1715	CGCUUGCC A UGUGCACG	765	CGTGCACA GGCTAGCTACAACGA GGCAAGCG	3349
1721	CCAUGUGC A CGAUGAGU	766	ACTCATCG GGCTAGCTACAACGA GCACATGG	3350
1762	CUUUUGUC A CCUUGGAC	772	GTCCAAGG GGCTAGCTACAACGA GACAAAAG	3351
1771	CCUUGGAC A UGGAAGAC	775	GTCTTCCA GGCTAGCTACAACGA GTCCAAGG	3352
1792	GCUACAAC A UUCCACAG	779	CTGTGGAA GGCTAGCTACAACGA GTTGTAGC	3353
1797	AACAUUCC A CAGACAGA	781	TCTGTCTG GGCTAGCTACAACGA GGAATGTT	3354
1819	CAACCCUC A UGACCAUA	788	TATGGTCA GGCTAGCTACAACGA GAGGGTTG	3355
1825	UCAUGACC A UAGCCUAU	790	ATAGGCTA GGCTAGCTACAACGA GGTCATGA	3356

Table 22

1837	CCUAUGUC A UGGCUGCC	793	GGCAGCCA GGCTAGCTACAACGA GACATAGG	3357
1846	UGGCUGCC A UCUGCGCC	796	GGCGCAGA GGCTAGCTACAACGA GGCAGCCA	3358
1861	CCCUCUUC A UGCUGCCA	802	TGGCAGCA GGCTAGCTACAACGA GAAGAGGG	3359
1869	AUGCUGCC A CUCUGCCU	805	AGGCAGAG GGCTAGCTACAACGA GGCAGCAT	3360
1879	UCUGCCUC A UGGUGUGU	810	ACACACCA GGCTAGCTACAACGA GAGGCAGA	3361
1922	CCAGCAGC A UGAUGACU	822	AGTCATCA GGCTAGCTACAACGA GCTGCTGG	3362
1942	CUGAUGAC A UCUCCCUG	825	CAGGGAGA GGCTAGCTACAACGA GTCATCAG	3363
1968	GGAGGCCC A UGGGCAGA	833	TCTGCCCA GGCTAGCTACAACGA GGGCCTCC	3364
1998	CCUGGACC A CACCUCCG	840	CGGAGGTG GGCTAGCTACAACGA GGTCCAGG	3365
2000	UGGACCAC A CCUCCGUG	841	CACGGAGG GGCTAGCTACAACGA GTGGTCCA	3366
2013	CGUGGUUC A CUUUGGUC	845	GACCAAAG GGCTAGCTACAACGA GAACCACG	3367
2022	CUUUGGUC A CAAGUAGG	847	CCTACTTG GGCTAGCTACAACGA GACCAAAG	3368
2035	UAGGAGAC A CAGAUGGC	849	GCCATCTG GGCTAGCTACAACGA GTCTCCTA	3369
2044	CAGAUGGC A CCUGUGGC	851	GCCACAGG GGCTAGCTACAACGA GCCATCTG	3370
2059	GCCAGAGC A CCUCAGGA	856	TCCTGAGG GGCTAGCTACAACGA GCTCTGGC	3371
2076	CCCUCCCC A CCCACCAA	866	TTGGTGGG GGCTAGCTACAACGA GGGGAGGG	3372
2080	CCCCACCC A CCAAAUGC	869	GCATTTGG GGCTAGCTACAACGA GGGTGGGG	3373
2174	AAAGAAGC A CUCUGCUG	885	CAGCAGAG GGCTAGCTACAACGA GCTTCTTT	3374
2201	UCUUGGUC A CCUCAAAU	891	ATTTGAGG GGCTAGCTACAACGA GACCAAGA	3375
2260	CUUUGUCC A CCAUUCCU	906	AGGAATGG GGCTAGCTACAACGA GGACAAAG	3376
2263	UGUCCACC A UUCCUUUA	908	TAAAGGAA GGCTAGCTACAACGA GGTGGACA	3377
2322	GUACUGGC A UCACACGC	922	GCGTGTGA GGCTAGCTACAACGA GCCAGTAC	3378
2325	CUGGCAUC A CACGCAGG	923	CCTGCGTG GGCTAGCTACAACGA GATGCCAG	3379
2327	GGCAUCAC A CGCAGGUU	924	AACCTGCG GGCTAGCTACAACGA GTGATGCC	3380
2421	GAGGAUGC A CAGUUUGC	945	GCAAACTG GGCTAGCTACAACGA GCATCCTC	3381
2470	AGCCUAAC A UUGGUGCA	954	TGCACCAA GGCTAGCTACAACGA GTTAGGCT	3382
11	ACGCGUCC G CAGCCCGC	960	GCGGGCTG GGCTAGCTACAACGA GGACGCGT	3383
18	CGCAGCCC G CCCGGGAG	961	CTCCCGGG GGCTAGCTACAACGA GGGCTGCG	3384
29	CGGGAGCU G CGAGCCGC	962	GCGGCTCG GGCTAGCTACAACGA AGCTCCCG	3385
36	UGCGAGCC G CGAGCUGG	964	CCAGCTCG GGCTAGCTACAACGA GGCTCGCA	3386
69	CAGCCAAC G CAGCCGCA	967	TGCGGCTG GGCTAGCTACAACGA GTTGGCTG	3387
75	ACGCAGCC G CAGGAGCC	968	GGCTCCTG GGCTAGCTACAACGA GGCTGCGT	3388
94	GAGCCCUU G CCCCUGCC	969	GGCAGGGG GGCTAGCTACAACGA AAGGGCTC	3389
100	UUGCCCCU G CCCGCGCC	970	GGCGCGGG GGCTAGCTACAACGA AGGGGCAA	3390
104	CCCUGCCC G CGCCGCCG	971	CGGCGGCG GGCTAGCTACAACGA GGGCAGGG	3391
106	CUGCCCGC G CCGCCGCC	972	GGCGGCGG GGCTAGCTACAACGA GCGGGCAG	3392
109	CCCGCGCC G CCGCCCGC	973	GCGGGCGG GGCTAGCTACAACGA GGCGCGGG	3393
112	GCGCCGCC G CCCGCCGG	974	CCGGCGGG GGCTAGCTACAACGA GGCGGCGC	3394
116	CGCCGCCC G CCGGGGGG	975	CCCCCCGG GGCTAGCTACAACGA GGGCGGCG	3395
137	GGGAAGCC G CCACCGGC	976	GCCGGTGG GGCTAGCTACAACGA GGCTTCCC	3396
148	ACCGGCCC G CCAUGCCC	977	GGGCATGG GGCTAGCTACAACGA GGGCCGGT	3397
153	CCCGCCAU G CCCGCCCC	978	GGGGCGGG GGCTAGCTACAACGA ATGGCGGG	3398
157	CCAUGCCC G CCCCUCCC	979	GGGAGGGG GGCTAGCTACAACGA GGGCATGG	3399
172	CCAGCCCC G CCGGGAGC	980	GCTCCCGG GGCTAGCTACAACGA GGGGCTGG	3400
183	GGGAGCCC G CGCCCGCU	981	AGCGGGCG GGCTAGCTACAACGA GGGCTCCC	3401
185	GAGCCCGC G CCCGCUGC	982	GCAGCGGG GGCTAGCTACAACGA GCGGGCTC	3402
189	CCGCGCCC G CUGCCCAG	983	CTGGGCAG GGCTAGCTACAACGA GGGCGCGG	3403
192	CGCCCGCU G CCCAGGCU	984	AGCCTGGG GGCTAGCTACAACGA AGCGGGCG	3404
205	GGCUGGCC G CCGCCGUG	985	CACGGCGG GGCTAGCTACAACGA GGCCAGCC	3405
208	UGGCCGCC G CCGUGCCG	986	CGGCACGG GGCTAGCTACAACGA GGCGGCCA	3406
213	GCCGCCGU G CCGAUGUA	987	TACATCGG GGCTAGCTACAACGA ACGGCGGC	3407

Table 22

250	UCUCCCCU G CUCCCGUG	989	CACGGGAG GGCTAGCTACAACGA AGGGGAGA	3408
258	GCUCCCGU G CUCUGCGG	990	CCGCAGAG GGCTAGCTACAACGA ACGGGAGC	3409
263	CGUGCUCU G CGGAUCUC	991	GAGATCCG GGCTAGCTACAACGA AGAGCACG	3410
280	CCCUGACC G CUCUCCAC	993	GTGGAGAG GGCTAGCTACAACGA GGTCAGGG	3411
320	AGGGCCCU G CAGGCCCU	994	AGGGCCTG GGCTAGCTACAACGA AGGGCCCT	3412
340	GUCCUGAU G CCCCCAAG	996	CTTGGGGG GGCTAGCTACAACGA ATCAGGAC	3413
397	GGGCAGGC G CCAGGGAC	998	GTCCCTGG GGCTAGCTACAACGA GCCTGCCC	3414
420	GGGCCAGU G CGAGCCCA	999	TGGGCTCG GGCTAGCTACAACGA ACTGGCCC	3415
468	CAAGCCCU G CCCUGGCU	1002	AGCCAGGG GGCTAGCTACAACGA AGGGCTTG	3416
480	UGGCUCCU G CUGUGGAU	1003	ATCCACAG GGCTAGCTACAACGA AGGAGCCA	3417
493	GGAUGGGC G CGGGAGUG	1004	CACTCCCG GGCTAGCTACAACGA GCCCATCC	3418
501	GCGGGAGU G CUGCCUGC	1005	GCAGGCAG GGCTAGCTACAACGA ACTCCCGC	3419
504	GGAGUGCU G CCUGCCCA	1006	TGGGCAGG GGCTAGCTACAACGA AGCACTCC	3420
508	UGCUGCCU G CCCACGGC	1007	GCCGTGGG GGCTAGCTACAACGA AGGCAGCA	3421
537	AUCCGGCU G CCCCUGCG	1008	CGCAGGGG GGCTAGCTACAACGA AGCCGGAT	3422
543	CUGCCCCU G CGCAGCGG	1009	CCGCTGCG GGCTAGCTACAACGA AGGGGCAG	3423
545	GCCCCUGC G CAGCGGCC	1010	GGCCGCTG GGCTAGCTACAACGA GCAGGGGC	3424
562	UGGGGGGC G CCCCCCUG	1011	CAGGGGGG GGCTAGCTACAACGA GCCCCCCA	3425
576	CUGGGGCU G CGGCUGCC	1012	GGCAGCCG GGCTAGCTACAACGA AGCCCCAG	3426
582	CUGCGGCU G CCCCGGGA	1013	TCCCGGGG GGCTAGCTACAACGA AGCCGCAG	3427
708	AGCCCCCC G CAGACGCU	1019	AGCGTCTG GGCTAGCTACAACGA GGGGGGCT	3428
714	CCGCAGAC G CUCAACAU	1020	ATGTTGAG GGCTAGCTACAACGA GTCTGCGG	3429
751	GUAACUUU G CAGUGGGU	1021	ACCCACTG GGCTAGCTACAACGA AAAGTTAC	3430
760	CAGUGGGU G CUGCCCCC	1022	GGGGGCAG GGCTAGCTACAACGA ACCCACTG	3431
763	UGGGUGCU G CCCCCCAC	1023	GTGGGGGG GGCTAGCTACAACGA AGCACCCA	3432
780	CCCUUCCU G CAUCGCUA	1024	TAGCGATG GGCTAGCTACAACGA AGGAAGGG	3433
785	CCUGCAUC G CUACUACC	1025	GGTAGTAG GGCTAGCTACAACGA GATGCAGG	3434
843	GUGUAUGU G CCCUACAC	1026	GTGTAGGG GGCTAGCTACAACGA ACATACAC	3435
921	GUCACUGU G CGUGCCAA	1028	TTGGCACG GGCTAGCTACAACGA ACAGTGAC	3436
925	CUGUGCGU G CCAACAUU	1029	AATGTTGG GGCTAGCTACAACGA ACGCACAG	3437
934	CCAACAUU G CUGCCAUC	1030	GATGGCAG GGCTAGCTACAACGA AATGTTGG	3438
937	ACAUUGCU G CCAUCACU	1031	AGTGATGG GGCTAGCTACAACGA AGCAATGT	3439
1006	UGGCCUAU G CUGAGAUU	1033	AATCTCAG GGCTAGCTACAACGA ATAGGCCA	3440
1015	CUGAGAUU G CCAGGCCU	1035	AGGCCTGG GGCTAGCTACAACGA AATCTCAG	3441
1092	UUCUCCCU G CAGCUUUG	1039	CAAAGCTG GGCTAGCTACAACGA AGGGAGAA	3442
1105	UUUGUGGU G CUGGCUUC	1040	GAAGCCAG GGCTAGCTACAACGA ACCACAAA	3443
1134	UCUGAAGU G CUGGCCUC	1042	GAGGCCAG GGCTAGCTACAACGA ACTTCAGA	3444
1182	GACCACUC G CUGUACAC	1045	GTGTACAG GGCTAGCTACAACGA GAGTGGTC	3445
1248	AUCAUUGU G CGGGUGGA	1048	TCCACCCG GGCTAGCTACAACGA ACAATGAT	3446
1286	AAUGGACU G CAAGGAGU	1050	ACTCCTTG GGCTAGCTACAACGA AGTCCATT	3447
1344	CUUCGUUU G CCCAAGAA	1052	TTCTTGGG GGCTAGCTACAACGA AAACGAAG	3448
1366	UUGAAGCU G CAGUCAAA	1054	TTTGACTG GGCTAGCTACAACGA AGCTTCAA	3449
1442	GCUGGUGU G CUGGCAAG	1056	CTTGCCAG GGCTAGCTACAACGA ACACCAGC	3450
1526	GUCCUUCC G CAUCACCA	1058	TGGTGATG GGCTAGCTACAACGA GGAAGGAC	3451
1542	AUCCUUCC G CAGCAAUA	1059	TATTGCTG GGCTAGCTACAACGA GGAAGGAT	3452
1554	CAAUACCU G CGGCCAGU	1060	ACTGGCCG GGCTAGCTACAACGA AGGTATTG	3453
1603	ACAAGUUU G CCAUCUCA	1062	TGAGATGG GGCTAGCTACAACGA AAACTTGT	3454
1699	UUGGCUUU G CUGUCAGC	1066	GCTGACAG GGCTAGCTACAACGA AAAGCCAA	3455
1708	CUGUCAGC G CUUGCCAU	1067	ATGGCAAG GGCTAGCTACAACGA GCTGACAG	3456
1712	CAGCGCUU G CCAUGUGC	1068	GCACATGG GGCTAGCTACAACGA AAGCGCTG	3457
1719	UGCCAUGU G CACGAUGA	1069	TCATCGTG GGCTAGCTACAACGA ACATGGCA	3458

Table 22

1843	UCAUGGCU G CCAUCUGC	1074	GCAGATGG GGCTAGCTACAACGA AGCCATGA	3459
1850	UGCCAUCU G CGCCCUCU	1075	AGAGGGCG GGCTAGCTACAACGA AGATGGCA	3460
1852	CCAUCUGC G CCCUCUUC	1076	GAAGAGGG GGCTAGCTACAACGA GCAGATGG	3461
1863	CUCUUCAU G CUGCCACU	1077	AGTGGCAG GGCTAGCTACAACGA ATGAAGAG	3462
1866	UUCAUGCU G CCACUCUG	1078	CAGAGTGG GGCTAGCTACAACGA AGCATGAA	3463
1874	GCCACUCU G CCUCAUGG	1079	CCATGAGG GGCTAGCTACAACGA AGAGTGGC	3464
1895	UCAGUGGC G CUGCCUCC	1080	GGAGGCAG GGCTAGCTACAACGA GCCACTGA	3465
1898	GUGGCGCU G CCUCCGCU	1081	AGCGGAGG GGCTAGCTACAACGA AGCGCCAC	3466
1904	CUGCCUCC G CUGCCUGC	1082	GCAGGCAG GGCTAGCTACAACGA GGAGGCAG	3467
1907	CCUCCGCU G CCUGCGCC	1083	GGCGCAGG GGCTAGCTACAACGA AGCGGAGG	3468
1911	CGCUGCCU G CGCCAGCA	1084	TGCTGGCG GGCTAGCTACAACGA AGGCAGCG	3469
1913	CUGCCUGC G CCAGCAGC	1085	GCTGCTGG GGCTAGCTACAACGA GCAGGCAG	3470
1933	AUGACUUU G CUGAUGAC	1088	GTCATCAG GGCTAGCTACAACGA AAAGTCAT	3471
1950	AUCUCCCU G CUGAAGUG	1091	CACTTCAG GGCTAGCTACAACGA AGGGAGAT	3472
2087	CACCAAAU G CCUCUGCC	1094	GGCAGAGG GGCTAGCTACAACGA ATTTGGTG	3473
2093	AUGCCUCU G CCUUGAUG	1095	CATCAAGG GGCTAGCTACAACGA AGAGGCAT	3474
2179	AGCACUCU G CUGGCGGG	1097	CCCGCCAG GGCTAGCTACAACGA AGAGTGCT	3475
2227	GAAAUUCU G CUGCUUGA	1098	TCAAGCAG GGCTAGCTACAACGA AGAATTTC	3476
2230	AUUCUGCU G CUUGAAAC	1099	GTTTCAAG GGCTAGCTACAACGA AGCAGAAT	3477
2329	CAUCACAC G CAGGUUAC	1102	GTAACCTG GGCTAGCTACAACGA GTGTGATG	3478
2393	GUUUCCCU G CUGGCCAA	1103	TTGGCCAG GGCTAGCTACAACGA AGGGAAAC	3479
2419	GAGAGGAU G CACAGUUU	1104	AAACTGTG GGCTAGCTACAACGA ATCCTCTC	3480
2428	CACAGUUU G CUAUUUGC	1105	GCAAATAG GGCTAGCTACAACGA AAACTGTG	3481
2435	UGCUAUUU G CUUUAGAG	1106	CTCTAAAG GGCTAGCTACAACGA AAATAGCA	3482
2476	ACAUUGGU G CAAAGAUU	1107	AATCTTTG GGCTAGCTACAACGA ACCAATGT	3483
2485	CAAAGAUU G CCUCUUGA	1108	TCAAGAGG GGCTAGCTACAACGA AATCTTTG	3484
219	GUGCCGAU G UAGCGGGC	1110	GCCCGCTA GGCTAGCTACAACGA ATCGGCAC	3485
483	CUCCUGCU G UGGAUGGG	1111	CCCATCCA GGCTAGCTACAACGA AGCAGGAG	3486
634	GCAGCUUU G UGGAGAUG	1112	CATCTCCA GGCTAGCTACAACGA AAAGCTGC	3487
804	AGGCAGCU G UCCAGCAC	1113	GTGCTGGA GGCTAGCTACAACGA AGCTGCCT	3488
835	GGAAGGGU G UGUAUGUG	1114	CACATACA GGCTAGCTACAACGA ACCCTTCC	3489
837	AAGGGUGU G UAUGUGCC	1115	GGCACATA GGCTAGCTACAACGA ACACCCTT	3490
841	GUGUGUAU G UGCCCUAC	1116	GTAGGGCA GGCTAGCTACAACGA ATACACAC	3491
919	ACGUCACU G UGCGUGCC	1117	GGCACGCA GGCTAGCTACAACGA AGTGACGT	3492
1100	GCAGCUUU G UGGUGCUG	1118	CAGCACCA GGCTAGCTACAACGA AAAGCTGC	3493
1144	UGGCCUCU G UCGGAGGG	1119	CCCTCCGA GGCTAGCTACAACGA AGAGGCCA	3494
1185	CACUCGCU G UACACAGG	1120	CCTGTGTA GGCTAGCTACAACGA AGCGAGTG	3495
1246	UGAUCAUU G UGCGGGUG	1121	CACCCGCA GGCTAGCTACAACGA AATGATCA	3496
1315	AGAGCAUU G UGGACAGU	1122	ACTGTCCA GGCTAGCTACAACGA AATGCTCT	3497
1356	AAGAAAGU G UUUGAAGC	1123	GCTTCAAA GGCTAGCTACAACGA ACTTTCTT	3498
1440	CAGCUGGU G UGCUGGCA	1124	TGCCAGCA GGCTAGCTACAACGA ACCAGCTG	3499
1570	UGGAAGAU G UGGCCACG	1125	CGTGGCCA GGCTAGCTACAACGA ATCTTCCA	3500
1592	AGACGACU G UUACAAGU	1126	ACTTGTAA GGCTAGCTACAACGA AGTCGTCT	3501
1630	CGGGCACU G UUAUGGGA	1127	TCCCATAA GGCTAGCTACAACGA AGTGCCCG	3502
1642	UGGGAGCU G UUAUCAUG	1128	CATGATAA GGCTAGCTACAACGA AGCTCCCA	3503
1666	UCUACGUU G UCUUUGAU	1129	ATCAAAGA GGCTAGCTACAACGA AACGTAGA	3504
1702	GCUUUGCU G UCAGCGCU	1130	AGCGCTGA GGCTAGCTACAACGA AGCAAAGC	3505
1717	CUUGCCAU G UGCACGAU	1131	ATCGTGCA GGCTAGCTACAACGA ATGGCAAG	3506
1759	GCCCUUUU G UCACCUUG	1132	CAAGGTGA GGCTAGCTACAACGA AAAAGGGC	3507
1781	GGAAGACU G UGGCUACA	1133	TGTAGCCA GGCTAGCTACAACGA AGTCTTCC	3508
1834	UAGCCUAU G UCAUGGCU	1134	AGCCATGA GGCTAGCTACAACGA ATAGGCTA	3509

Table 22

1884	CUCAUGGU G UGUCAGUG	1135	CACTGACA GGCTAGCTACAACGA ACCATGAG	3510
1886	CAUGGUGU G UCAGUGGC	1136	GCCACTGA GGCTAGCTACAACGA ACACCATG	3511
2048	UGGCACCU G UGGCCAGA	1137	TCTGGCCA GGCTAGCTACAACGA AGGTGCCA	3512
2139	CAGGGACU G UACCUGUA	1138	TACAGGTA GGCTAGCTACAACGA AGTCCCTG	3513
2145	CUGUACCU G UAGGAAAC	1139	GTTTCCTA GGCTAGCTACAACGA AGGTACAG	3514
2256	GAACCUUU G UCCACCAU	1140	ATGGTGGA GGCTAGCTACAACGA AAAGGTTC	3515
2346	CUUGGCGU G UGUCCCUG	1141	CAGGGACA GGCTAGCTACAACGA ACGCCAAG	3516
2348	UGGCGUGU G UCCCUGUG	1142	CACAGGGA GGCTAGCTACAACGA ACACGCCA	3517
2354	GUGUCCCU G UGGUACCC	1143	GGGTACCA GGCTAGCTACAACGA AGGGACAC	3518
2385	CCAAGCUU G UUUCCCUG	1144	CAGGGAAA GGCTAGCTACAACGA AAGCTTGG	3519
2453	CAGGGACU G UAUAAACA	1145	TGTTTATA GGCTAGCTACAACGA AGTCCCTG	3520
14	CGUCCGCA G CCCGCCCG	1146	CGGGCGGG GGCTAGCTACAACGA TGCGGACG	3521
26	GCCCGGGA G CUGCGAGC	1147	GCTCGCAG GGCTAGCTACAACGA TCCCGGGC	3522
33	AGCUGCGA G CCGCGAGC	1148	GCTCGCGG GGCTAGCTACAACGA TCGCAGCT	3523
40	AGCCGCGA G CUGGAUUA	1149	TAATCCAG GGCTAGCTACAACGA TCGCGGCT	3524
51	GGAUUAUG G UGGCCUGA	1150	TCAGGCCA GGCTAGCTACAACGA CATAATCC	3525
54	UUAUGGUG G CCUGAGCA	1151	TGCTCAGG GGCTAGCTACAACGA CACCATAA	3526
60	UGGCCUGA G CAGCCAAC	1152	GTTGGCTG GGCTAGCTACAACGA TCAGGCCA	3527
63	CCUGAGCA G CCAACGCA	1153	TGCGTTGG GGCTAGCTACAACGA TGCTCAGG	3528
72	CCAACGCA G CCGCAGGA	1154	TCCTGCGG GGCTAGCTACAACGA TGCGTTGG	3529
81	CCGCAGGA G CCCGGAGC	1155	GCTCCGGG GGCTAGCTACAACGA TCCTGCGG	3530
88	AGCCCGGA G CCCUUGCC	1156	GGCAAGGG GGCTAGCTACAACGA TCCGGGCT	3531
134	CCAGGGAA G CCGCCACC	1157	GGTGGCGG GGCTAGCTACAACGA TTCCCTGG	3532
144	CGCCACCG G CCCGCCAU	1158	ATGGCGGG GGCTAGCTACAACGA CGGTGGCG	3533
167	CCCUCCCA G CCCCGCCG	1159	CGGCGGGG GGCTAGCTACAACGA TGGGAGGG	3534
179	CGCCGGGA G CCCGCGCC	1160	GGCGCGGG GGCTAGCTACAACGA TCCCGGCG	3535
198	CUGCCCAG G CUGGCCGC	1161	GCGGCCAG GGCTAGCTACAACGA CTGGGCAG	3536
202	CCAGGCUG G CCGCCGCC	1162	GGCGGCGG GGCTAGCTACAACGA CAGCCTGG	3537
211	CCGCCGCC G UGCCGAUG	1163	CATCGGCA GGCTAGCTACAACGA GGCGGCGG	3538
222	CCGAUGUA G CGGGCUCC	1164	GGAGCCCG GGCTAGCTACAACGA TACATCGG	3539
226	UGUAGCGG G CUCCGGAU	1165	ATCCGGAG GGCTAGCTACAACGA CCGCTACA	3540
239	GGAUCCCA G CCUCUCCC	1166	GGGAGAGG GGCTAGCTACAACGA TGGGATCC	3541
256	CUGCUCCC G UGCUCUGC	1167	GCAGAGCA GGCTAGCTACAACGA GGGAGCAG	3542
290	UCUCCACA G CCCGGACC	1168	GGTCCGGG GGCTAGCTACAACGA TGTGGAGA	3543
304	ACCCGGGG G CUGGCCCA	1169	TGGGCCAG GGCTAGCTACAACGA CCCCGGGT	3544
308	GGGGGCUG G CCCAGGGC	1170	GCCCTGGG GGCTAGCTACAACGA CAGCCCCC	3545
315	GGCCCAGG G CCCUGCAG	1171	CTGCAGGG GGCTAGCTACAACGA CCTGGGCC	3546
324	CCCUGCAG G CCCUGGCG	1172	CGCCAGGG GGCTAGCTACAACGA CTGCAGGG	3547
330	AGGCCCUG G CGUCCUGA	1173	TCAGGACG GGCTAGCTACAACGA CAGGGCCT	3548
332	GCCCUGGC G UCCUGAUG	1174	CATCAGGA GGCTAGCTACAACGA GCCAGGGC	3549
348	GCCCCCAA G CUCCCUCU	1175	AGAGGGAG GGCTAGCTACAACGA TTGGGGGC	3550
365	CCUGAGAA G CCACCAGC	1176	GCTGGTGG GGCTAGCTACAACGA TTCTCAGG	3551
372	AGCCACCA G CACCACCC	1177	GGGTGGTG GGCTAGCTACAACGA TGGTGGCT	3552
391	ACUUGGGG G CAGGCGCC	1178	GGCGCCTG GGCTAGCTACAACGA CCCCAAGT	3553
395	GGGGGCAG G CGCCAGGG	1179	CCCTGGCG GGCTAGCTACAACGA CTGCCCCC	3554
410	GGACGGAC G UGGGCCAG	1180	CTGGCCCA GGCTAGCTACAACGA GTCCGTCC	3555
414	GGACGUGG G CCAGUGCG	1181	CGCACTGG GGCTAGCTACAACGA CCACGTCC	3556
418	GUGGGCCA G UGCGAGCC	1182	GGCTCGCA GGCTAGCTACAACGA TGGCCCAC	3557
424	CAGUGCGA G CCCAGAGG	1183	CCTCTGGG GGCTAGCTACAACGA TCGCACTG	3558
433	CCCAGAGG G CCCGAAGG	1184	CCTTCGGG GGCTAGCTACAACGA CCTCTGGG	3559
441	GCCCGAAG G CCGGGGCC	1185	GGCCCCGG GGCTAGCTACAACGA CTTCGGGC	3560

Table 22

447	AGGCCGGG G CCCACCAU	1186	ATGGTGGG GGCTAGCTACAACGA CCCGGCCT	3561
457	CCACCAUG G CCCAAGCC	1187	GGCTTGGG GGCTAGCTACAACGA CATGGTGG	3562
463	UGGCCCAA G CCCUGCCC	1188	GGGCAGGG GGCTAGCTACAACGA TTGGGCCA	3563
474	CUGCCCUG G CUCCUGCU	1189	AGCAGGAG GGCTAGCTACAACGA CAGGGCAG	3564
491	GUGGAUGG G CGCGGGAG	1190	CTCCCGCG GGCTAGCTACAACGA CCATCCAC	3565
499	GCGCGGGA G UGCUGCCU	1191	AGGCAGCA GGCTAGCTACAACGA TCCCGCGC	3566
515	UGCCCACG G CACCCAGC	1192	GCTGGGTG GGCTAGCTACAACGA CGTGGGCA	3567
522	GGCACCCA G CACGGCAU	1193	ATGCCGTG GGCTAGCTACAACGA TGGGTGCC	3568
527	CCAGCACG G CAUCCGGC	1194	GCCGGATG GGCTAGCTACAACGA CGTGCTGG	3569
534	GGCAUCCG G CUGCCCCU	1195	AGGGGCAG GGCTAGCTACAACGA CGGATGCC	3570
548	CCUGCGCA G CGGCCUGG	1196	CCAGGCCG GGCTAGCTACAACGA TGCGCAGG	3571
551	GCGCAGCG G CCUGGGGG	1197	CCCCCAGG GGCTAGCTACAACGA CGCTGCGC	3572
560	CCUGGGGG G CGCCCCCC	1198	GGGGGGCG GGCTAGCTACAACGA CCCCCAGG	3573
573	CCCCUGGG G CUGCGGCU	1199	AGCCGCAG GGCTAGCTACAACGA CCCAGGGG	3574
579	GGGCUGCG G CUGCCCCG	1200	CGGGGCAG GGCTAGCTACAACGA CGCAGCCC	3575
603	GACGAAGA G CCCGAGGA	1201	TCCTCGGG GGCTAGCTACAACGA TCTTCGTC	3576
612	CCCGAGGA G CCCGGCCG	1202	CGGCCGGG GGCTAGCTACAACGA TCCTCGGG	3577
617	GGAGCCCG G CCGGAGGG	1203	CCCTCCGG GGCTAGCTACAACGA CGGGCTCC	3578
626	CCGGAGGG G CAGCUUUG	1204	CAAAGCTG GGCTAGCTACAACGA CCCTCCGG	3579
629	GAGGGGCA G CUUUGUGG	1205	CCACAAAG GGCTAGCTACAACGA TGCCCCTC	3580
643	UGGAGAUG G UGGACAAC	1206	GTTGTCCA GGCTAGCTACAACGA CATCTCCA	3581
659	CCUGAGGG G CAAGUCGG	1207	CCGACTTG GGCTAGCTACAACGA CCCTCAGG	3582
663	AGGGGCAA G UCGGGGCA	1208	TGCCCCGA GGCTAGCTACAACGA TTGCCCCT	3583
669	AAGUCGGG G CAGGGCUA	1209	TAGCCCTG GGCTAGCTACAACGA CCCGACTT	3584
674	GGGGCAGG G CUACUACG	1210	CGTAGTAG GGCTAGCTACAACGA CCTGCCCC	3585
682	GCUACUAC G UGGAGAUG	1211	CATCTCCA GGCTAGCTACAACGA GTAGTAGC	3586
694	AGAUGACC G UGGGCAGC	1212	GCTGCCCA GGCTAGCTACAACGA GGTCATCT	3587
698	GACCGUGG G CAGCCCCC	1213	GGGGGCTG GGCTAGCTACAACGA CCACGGTC	3588
701	CGUGGGCA G CCCCCCGC	1214	GCGGGGGG GGCTAGCTACAACGA TGCCCACG	3589
727	ACAUCCUG G UGGAUACA	1215	TGTATCCA GGCTAGCTACAACGA CAGGATGT	3590
737	GGAUACAG G CAGCAGUA	1216	TACTGCTG GGCTAGCTACAACGA CTGTATCC	3591
740	UACAGGCA G CAGUAACU	1217	AGTTACTG GGCTAGCTACAACGA TGCCTGTA	3592
743	AGGCAGCA G UAACUUUG	1218	CAAAGTTA GGCTAGCTACAACGA TGCTGCCT	3593
754	ACUUUGCA G UGGGUGCU	1219	AGCACCCA GGCTAGCTACAACGA TGCAAAGT	3594
758	UGCAGUGG G UGCUGCCC	1220	GGGCAGCA GGCTAGCTACAACGA CCACTGCA	3595
798	UACCAGAG G CAGCUGUC	1221	GACAGCTG GGCTAGCTACAACGA CTCTGGTA	3596
801	CAGAGGCA G CUGUCCAG	1222	CTGGACAG GGCTAGCTACAACGA TGCCTCTG	3597
809	GCUGUCCA G CACAUACC	1223	GGTATGTG GGCTAGCTACAACGA TGGACAGC	3598
833	CCGGAAGG G UGUGUAUG	1224	CATACACA GGCTAGCTACAACGA CCTTCCGG	3599
857	CACCCAGG G CAAGUGGG	1225	CCCACTTG GGCTAGCTACAACGA CCTGGGTG	3600
861	CAGGGCAA G UGGGAAGG	1226	CCTTCCCA GGCTAGCTACAACGA TTGCCCTG	3601
873	GAAGGGGA G CUGGGCAC	1227	GTGCCCAG GGCTAGCTACAACGA TCCCCTTC	3602
878	GGAGCUGG G CACCGACC	1228	GGTCGGTG GGCTAGCTACAACGA CCAGCTCC	3603
889	CCGACCUG G UAAGCAUC	1229	GATGCTTA GGCTAGCTACAACGA CAGGTCGG	3604
893	CCUGGUAA G CAUCCCCC	1230	GGGGGATG GGCTAGCTACAACGA TTACCAGG	3605
905	CCCCCAUG G CCCCAACG	1231	CGTTGGGG GGCTAGCTACAACGA CATGGGGG	3606
913	GCCCCAAC G UCACUGUG	1232	CACAGTGA GGCTAGCTACAACGA GTTGGGGC	3607
923	CACUGUGC G UGCCAACA	1233	TGTTGGCA GGCTAGCTACAACGA GCACAGTG	3608
957	UCAGACAA G UUCUUCAU	1234	ATGAAGAA GGCTAGCTACAACGA TTGTCTGA	3609
971	CAUCAACG G CUCCAACU	1235	AGTTGGAG GGCTAGCTACAACGA CGTTGATG	3610
986	CUGGGAAG G CAUCCUGG	1236	CCAGGATG GGCTAGCTACAACGA CTTCCCAG	3611

Table 22

996	AUCCUGGG G CUGGCCUA	1237	TAGGCCAG GGCTAGCTACAACGA CCCAGGAT	3612
1000	UGGGGCUG G CCUAUGCU	1238	AGCATAGG GGCTAGCTACAACGA CAGCCCCA	3613
1020	AUUGCCAG G CCUGACGA	1239	TCGTCAGG GGCTAGCTACAACGA CTGGCAAT	3614
1038	UCCCUGGA G CCUUUCUU	1240	AAGAAAGG GGCTAGCTACAACGA TCCAGGGA	3615
1057	ACUCUCUG G UAAAGCAG	1241	CTGCTTTA GGCTAGCTACAACGA CAGAGAGT	3616
1062	CUGGUAAA G CAGACCCA	1242	TGGGTCTG GGCTAGCTACAACGA TTTACCAG	3617
1072	AGACCCAC G UUCCCAAC	1243	GTTGGGAA GGCTAGCTACAACGA GTGGGTCT	3618
1095	UCCCUGCA G CUUUGUGG	1244	CCACAAAG GGCTAGCTACAACGA TGCAGGGA	3619
1103	GCUUUGUG G UGCUGGCU	1245	AGCCAGCA GGCTAGCTACAACGA CACAAAGC	3620
1109	UGGUGCUG G CUUCCCCC	1246	GGGGGAAG GGCTAGCTACAACGA CAGCACCA	3621
1125	CUCAACCA G UCUGAAGU	1247	ACTTCAGA GGCTAGCTACAACGA TGGTTGAG	3622
1132	AGUCUGAA G UGCUGGCC	1248	GGCCAGCA GGCTAGCTACAACGA TTCAGACT	3623
1138	AAGUGCUG G CCUCUGUC	1249	GACAGAGG GGCTAGCTACAACGA CAGCACTT	3624
1154	CGGAGGGA G CAUGAUCA	1250	TGATCATG GGCTAGCTACAACGA TCCCTCCG	3625
1169	CAUUGGAG G UAUCGACC	1251	GGTCGATA GGCTAGCTACAACGA CTCCAATG	3626
1193	GUACACAG G CAGUCUCU	1252	AGAGACTG GGCTAGCTACAACGA CTGTGTAC	3627
1196	CACAGGCA G UCUCUGGU	1253	ACCAGAGA GGCTAGCTACAACGA TGCCTGTG	3628
1203	AGUCUCUG G UAUACACC	1254	GGTGTATA GGCTAGCTACAACGA CAGAGACT	3629
1218	CCCAUCCG G CGGGAGUG	1255	CACTCCCG GGCTAGCTACAACGA CGGATGGG	3630
1224	CGGCGGGA G UGGUAUUA	1256	TAATACCA GGCTAGCTACAACGA TCCCGCCG	3631
1227	CGGGAGUG G UAUUAUGA	1257	TCATAATA GGCTAGCTACAACGA CACTCCCG	3632
1237	AUUAUGAG G UGAUCAUU	1258	AATGATCA GGCTAGCTACAACGA CTCATAAT	3633
1252	UUGUGCGG G UGGAGAUC	1259	GATCTCCA GGCTAGCTACAACGA CCGCACAA	3634
1293	UGCAAGGA G UACAACUA	1260	TAGTTGTA GGCTAGCTACAACGA TCCTTGCA	3635
1310	UGACAAGA G CAUUGUGG	1261	CCACAATG GGCTAGCTACAACGA TCTTGTCA	3636
1322	UGUGGACA G UGGCACCA	1262	TGGTGCCA GGCTAGCTACAACGA TGTCCACA	3637
1325	GGACAGUG G CACCACCA	1263	TGGTGGTG GGCTAGCTACAACGA CACTGTCC	3638
1340	CAACCUUC G UUUGCCCA	1264	TGGGCAAA GGCTAGCTACAACGA GAAGGTTG	3639
1354	CCAAGAAA G UGUUUGAA	1265	TTCAAACA GGCTAGCTACAACGA TTTCTTGG	3640
1363	UGUUUGAA G CUGCAGUC	1266	GACTGCAG GGCTAGCTACAACGA TTCAAACA	3641
1369	AAGCUGCA G UCAAAUCC	1267	GGATTTGA GGCTAGCTACAACGA TGCAGCTT	3642
1384	CCAUCAAG G CAGCCUCC	1268	GGAGGCTG GGCTAGCTACAACGA CTTGATGG	3643
1387	UCAAGGCA G CCUCCUCC	1269	GGAGGAGG GGCTAGCTACAACGA TGCCTTGA	3644
1404	ACGGAGAA G UUCCCUGA	1270	TCAGGGAA GGCTAGCTACAACGA TTCTCCGT	3645
1415	CCCUGAUG G UUUCUGGC	1271	GCCAGAAA GGCTAGCTACAACGA CATCAGGG	3646
1422	GGUUUCUG G CUAGGAGA	1272	TCTCCTAG GGCTAGCTACAACGA CAGAAACC	3647
1431	CUAGGAGA G CAGCUGGU	1273	ACCAGCTG GGCTAGCTACAACGA TCTCCTAG	3648
1434	GGAGAGCA G CUGGUGUG	1274	CACACCAG GGCTAGCTACAACGA TGCTCTCC	3649
1438	AGCAGCUG G UGUGCUGG	1275	CCAGCACA GGCTAGCTACAACGA CAGCTGCT	3650
1446	GUGUGCUG G CAAGCAGG	1276	CCTGCTTG GGCTAGCTACAACGA CAGCACAC	3651
1450	GCUGGCAA G CAGGCACC	1277	GGTGCCTG GGCTAGCTACAACGA TTGCCAGC	3652
1454	GCAAGCAG G CACCACCC	1278	GGGTGGTG GGCTAGCTACAACGA CTGCTTGC	3653
1480	UUUUCCCA G UCAUCUCA	1279	TGAGATGA GGCTAGCTACAACGA TGGGAAAA	3654
1502	CCUAAUGG G UGAGGUUA	1280	TAACCTCA GGCTAGCTACAACGA CCATTAGG	3655
1507	UGGGUGAG G UUACCAAC	1281	GTTGGTAA GGCTAGCTACAACGA CTCACCCA	3656
1518	ACCAACCA G UCCUUCCG	1282	CGGAAGGA GGCTAGCTACAACGA TGGTTGGT	3657
1545	CUUCCGCA G CAAUACCU	1283	AGGTATTG GGCTAGCTACAACGA TGCGGAAG	3658
1557	UACCUGCG G CCAGUGGA	1284	TCCACTGG GGCTAGCTACAACGA CGCAGGTA	3659
1561	UGCGGCCA G UGGAAGAU	1285	ATCTTCCA GGCTAGCTACAACGA TGGCCGCA	3660
1573	AAGAUGUG G CCACGUCC	1286	GGACGTGG GGCTAGCTACAACGA CACATCTT	3661
1578	GUGGCCAC G UCCCAAGA	1287	TCTTGGGA GGCTAGCTACAACGA GTGGCCAC	3662

Table 22

1599	UGUUACAA G UUUGCCAU	1288	ATGGCAAA GGCTAGCTACAACGA TTGTAACA	3663
1614	AUCUCACA G UCAUCCAC	1289	GTGGATGA GGCTAGCTACAACGA TGTGAGAT	3664
1625	AUCCACGG G CACUGUUA	1290	TAACAGTG GGCTAGCTACAACGA CCGTGGAT	3665
1639	UUAUGGGA G CUGUUAUC	1291	GATAACAG GGCTAGCTACAACGA TCCCATAA	3666
1655	CAUGGAGG G CUUCUACG	1292	CGTAGAAG GGCTAGCTACAACGA CCTCCATG	3667
1663	GCUUCUAC G UUGUCUUU	1293	AAAGACAA GGCTAGCTACAACGA GTAGAAGC	3668
1678	UUGAUCGG G CCCGAAAA	1294	TTTTCGGG GGCTAGCTACAACGA CCGATCAA	3669
1694	ACGAAUUG G CUUUGCUG	1295	CAGCAAAG GGCTAGCTACAACGA CAATTCGT	3670
1706	UGCUGUCA G CGCUUGCC	1296	GGCAAGCG GGCTAGCTACAACGA TGACAGCA	3671
1728	CACGAUGA G UUCAGGAC	1297	GTCCTGAA GGCTAGCTACAACGA TCATCGTG	3672
1738	UCAGGACG G CAGCGGUG	1298	CACCGCTG GGCTAGCTACAACGA CGTCCTGA	3673
1741	GGACGGCA G CGGUGGAA	1299	TTCCACCG GGCTAGCTACAACGA TGCCGTCC	3674
1744	CGGCAGCG G UGGAAGGC	1300	GCCTTCCA GGCTAGCTACAACGA CGCTGCCG	3675
1751	GGUGGAAG G CCCUUUUG	1301	CAAAAGGG GGCTAGCTACAACGA CTTCCACC	3676
1784	AGACUGUG G CUACAACA	1302	TGTTGTAG GGCTAGCTACAACGA CACAGTCT	3677
1809	ACAGAUGA G UCAACCCU	1303	AGGGTTGA GGCTAGCTACAACGA TCATCTGT	3678
1828	UGACCAUA G CCUAUGUC	1304	GACATAGG GGCTAGCTACAACGA TATGGTCA	3679
1840	AUGUCAUG G CUGCCAUC	1305	GATGGCAG GGCTAGCTACAACGA CATGACAT	3680
1882	GCCUCAUG G UGUGUCAG	1306	CTGACACA GGCTAGCTACAACGA CATGAGGC	3681
1890	GUGUGUCA G UGGCGCUG	1307	CAGCGCCA GGCTAGCTACAACGA TGACACAC	3682
1893	UGUCAGUG G CGCUGCCU	1308	AGGCAGCG GGCTAGCTACAACGA CACTGACA	3683
1917	CUGCGCCA G CAGCAUGA	1309	TCATGCTG GGCTAGCTACAACGA TGGCGCAG	3684
1920	CGCCAGCA G CAUGAUGA	1310	TCATCATG GGCTAGCTACAACGA TGCTGGCG	3685
1956	CUGCUGAA G UGAGGAGG	1311	CCTCCTCA GGCTAGCTACAACGA TTCAGCAG	3686
1964	GUGAGGAG G CCCAUGGG	1312	CCCATGGG GGCTAGCTACAACGA CTCCTCAC	3687
1972	GCCCAUGG G CAGAAGAU	1313	ATCTTCTG GGCTAGCTACAACGA CCATGGGC	3688
2006	ACACCUCC G UGGUUCAC	1314	GTGAACCA GGCTAGCTACAACGA GGAGGTGT	3689
2009	CCUCCGUG G UUCACUUU	1315	AAAGTGAA GGCTAGCTACAACGA CACGGAGG	3690
2019	UCACUUUG G UCACAAGU	1316	ACTTGTGA GGCTAGCTACAACGA CAAAGTGA	3691
2026	GGUCACAA G UAGGAGAC	1317	GTCTCCTA GGCTAGCTACAACGA TTGTGACC	3692
2042	CACAGAUG G CACCUGUG	1318	CACAGGTG GGCTAGCTACAACGA CATCTGTG	3693
2051	CACCUGUG G CCAGAGCA	1319	TGCTCTGG GGCTAGCTACAACGA CACAGGTG	3694
2057	UGGCCAGA G CACCUCAG	1320	CTGAGGTG GGCTAGCTACAACGA TCTGGCCA	3695
2114	AGGAAAAG G CUGGCAAG	1321	CTTGCCAG GGCTAGCTACAACGA CTTTTCCT	3696
2118	AAAGGCUG G CAAGGUGG	1322	CCACCTTG GGCTAGCTACAACGA CAGCCTTT	3697
2123	CUGGCAAG G UGGGUUCC	1323	GGAACCCA GGCTAGCTACAACGA CTTGCCAG	3698
2127	CAAGGUGG G UUCCAGGG	1324	CCCTGGAA GGCTAGCTACAACGA CCACCTTG	3699
2172	AGAAAGAA G CACUCUGC	1325	GCAGAGTG GGCTAGCTACAACGA TTCTTTCT	3700
2183	CUCUGCUG G CGGGAAUA	1326	TATTCCCG GGCTAGCTACAACGA CAGCAGAG	3701
2198	UACUCUUG G UCACCUCA	1327	TGAGGTGA GGCTAGCTACAACGA CAAGAGTA	3702
2214	AAAUUUAA G UCGGGAAA	1328	TTTCCCGA GGCTAGCTACAACGA TTAAATTT	3703
2243	AAACUUCA G CCCUGAAC	1329	GTTCAGGG GGCTAGCTACAACGA TGAAGTTT	3704
2288	AACCCAAA G UAUUCUUC	1330	GAAGAATA GGCTAGCTACAACGA TTTGGGTT	3705
2305	UUUUCUUA G UUUCAGAA	1331	TTCTGAAA GGCTAGCTACAACGA TAAGAAAA	3706
2314	UUUCAGAA G UACUGGCA	1332	TGCCAGTA GGCTAGCTACAACGA TTCTGAAA	3707
2320	AAGUACUG G CAUCACAC	1333	GTGTGATG GGCTAGCTACAACGA CAGTACTT	3708
2333	ACACGCAG G UUACCUUG	1334	CAAGGTAA GGCTAGCTACAACGA CTGCGTGT	3709
2342	UUACCUUG G CGUGUGUC	1335	GACACACG GGCTAGCTACAACGA CAAGGTAA	3710
2344	ACCUUGGC G UGUGUCCC	1336	GGGACACA GGCTAGCTACAACGA GCCAAGGT	3711
2357	UCCCUGUG G UACCCUGG	1337	CCAGGGTA GGCTAGCTACAACGA CACAGGGA	3712
2365	GUACCCUG G CAGAGAAG	1338	CTTCTCTG GGCTAGCTACAACGA CAGGGTAC	3713

Table 22

2381	GAGACCAA G CUUGUUUC	1339	GAAACAAG GGCTAGCTACAACGA TTGGTCTC	3714
2397	CCCUGCUG G CCAAAGUC	1340	GACTTTGG GGCTAGCTACAACGA CAGCAGGG	3715
2403	UGGCCAAA G UCAGUAGG	1341	CCTACTGA GGCTAGCTACAACGA TTTGGCCA	3716
2407	CAAAGUCA G UAGGAGAG	1342	CTCTCCTA GGCTAGCTACAACGA TGACTTTG	3717
2424	GAUGCACA G UUUGCUAU	1343	ATAGCAAA GGCTAGCTACAACGA TGTGCATC	3718
2463	AUAAACAA G CCUAACAU	1344	ATGTTAGG GGCTAGCTACAACGA TTGTTTAT	3719
2474	UAACAUUG G UGCAAAGA	1345	TCTTTGCA GGCTAGCTACAACGA CAATGTTA	3720
45	CGAGCUGG A UUAUGGUG	1346	CACCATAA GGCTAGCTACAACGA CCAGCTCG	3721
67	AGCAGCCA A CGCAGCCG	1347	CGGCTGCG GGCTAGCTACAACGA TGGCTGCT	3722
125	CCGGGGGG A CCAGGGAA	1348	TTCCCTGG GGCTAGCTACAACGA CCCCCCGG	3723
217	CCGUGCCG A UGUAGCGG	1349	CCGCTACA GGCTAGCTACAACGA CGGCACGG	3724
233	GGCUCCGG A UCCCAGCC	1350	GGCTGGGA GGCTAGCTACAACGA CCGGAGCC	3725
267	CUCUGCGG A UCUCCCCU	1351	AGGGGAGA GGCTAGCTACAACGA CCGCAGAG	3726
277	CUCCCCUG A CCGCUCUC	1352	GAGAGCGG GGCTAGCTACAACGA CAGGGGAG	3727
296	CAGCCCGG A CCCGGGGG	1353	CCCCCGGG GGCTAGCTACAACGA CCGGGCTG	3728
338	GCGUCCUG A UGCCCCCA	1354	TGGGGGCA GGCTAGCTACAACGA CAGGACGC	3729
383	CCACCCAG A CUUGGGGG	1355	CCCCCAAG GGCTAGCTACAACGA CTGGGTGG	3730
404	CGCCAGGG A CGGACGUG	1356	CACGTCCG GGCTAGCTACAACGA CCCTGGCG	3731
408	AGGGACGG A CGUGGGCC	1357	GGCCCACG GGCTAGCTACAACGA CCGTCCCT	3732
487	UGCUGUGG A UGGGCGCG	1358	CGCGCCCA GGCTAGCTACAACGA CCACAGCA	3733
592	CCCGGGAG A CCGACGAA	1359	TTCGTCGG GGCTAGCTACAACGA CTCCCGGG	3734
596	GGAGACCG A CGAAGAGC	1360	GCTCTTCG GGCTAGCTACAACGA CGGTCTCC	3735
640	UUGUGGAG A UGGUGGAC	1361	GTCCACCA GGCTAGCTACAACGA CTCCACAA	3736
647	GAUGGUGG A CAACCUGA	1362	TCAGGTTG GGCTAGCTACAACGA CCACCATC	3737
650	GGUGGACA A CCUGAGGG	1363	CCCTCAGG GGCTAGCTACAACGA TGTCCACC	3738
688	ACGUGGAG A UGACCGUG	1364	CACGGTCA GGCTAGCTACAACGA CTCCACGT	3739
691	UGGAGAUG A CCGUGGGC	1365	GCCCACGG GGCTAGCTACAACGA CATCTCCA	3740
712	CCCCGCAG A CGCUCAAC	1366	GTTGAGCG GGCTAGCTACAACGA CTGCGGGG	3741
719	GACGCUCA A CAUCCUGG	1367	CCAGGATG GGCTAGCTACAACGA TGAGCGTC	3742
731	CCUGGUGG A UACAGGCA	1368	TGCCTGTA GGCTAGCTACAACGA CCACCAGG	3743
746	CAGCAGUA A CUUUGCAG	1369	CTGCAAAG GGCTAGCTACAACGA TACTGCTG	3744
821	AUACCGGG A CCUCCGGA	1370	TCCGGAGG GGCTAGCTACAACGA CCCGGTAT	3745
884	GGGCACCG A CCUGGUAA	1371	TTACCAGG GGCTAGCTACAACGA CGGTGCCC	3746
911	UGGCCCCA A CGUCACUG	1372	CAGTGACG GGCTAGCTACAACGA TGGGGCCA	3747
929	GCGUGCCA A CAUUGCUG	1373	CAGCAATG GGCTAGCTACAACGA TGGCACGC	3748
948	AUCACUGA A UCAGACAA	1374	TTGTCTGA GGCTAGCTACAACGA TCAGTGAT	3749
953	UGAAUCAG A CAAGUUCU	1375	AGAACTTG GGCTAGCTACAACGA CTGATTCA	3750
968	CUUCAUCA A CGGCUCCA	1376	TGGAGCCG GGCTAGCTACAACGA TGATGAAG	3751
977	CGGCUCCA A CUGGGAAG	1377	CTTCCCAG GGCTAGCTACAACGA TGGAGCCG	3752
1012	AUGCUGAG A UUGCCAGG	1378	CCTGGCAA GGCTAGCTACAACGA CTCAGCAT	3753
1025	CAGGCCUG A CGACUCCC	1379	GGGAGTCG GGCTAGCTACAACGA CAGGCCTG	3754
1028	GCCUGACG A CUCCCUGG	1380	CCAGGGAG GGCTAGCTACAACGA CGTCAGGC	3755
1049	UUUCUUUG A CUCUCUGG	1381	CCAGAGAG GGCTAGCTACAACGA CAAAGAAA	3756
1066	UAAAGCAG A CCCACGUU	1382	AACGTGGG GGCTAGCTACAACGA CTGCTTTA	3757
1079	CGUUCCCA A CCUCUUCU	1383	AGAAGAGG GGCTAGCTACAACGA TGGGAACG	3758
1121	CCCCCUCA A CCAGUCUG	1384	CAGACTGG GGCTAGCTACAACGA TGAGGGGG	3759
1159	GGAGCAUG A UCAUUGGA	1385	TCCAATGA GGCTAGCTACAACGA CATGCTCC	3760
1175	AGGUAUCG A CCACUCGC	1386	GCGAGTGG GGCTAGCTACAACGA CGATACCT	3761
1240	AUGAGGUG A UCAUUGUG	1387	CACAATGA GGCTAGCTACAACGA CACCTCAT	3762
1258	GGGUGGAG A UCAAUGGA	1388	TCCATTGA GGCTAGCTACAACGA CTCCACCC	3763
1262	GGAGAUCA A UGGACAGG	1389	CCTGTCCA GGCTAGCTACAACGA TGATCTCC	3764

Table 22

1266	AUCAAUGG A CAGGAUCU	1390	AGATCCTG GGCTAGCTACAACGA CCATTGAT	3765
1271	UGGACAGG A UCUGAAAA	1391	TTTTCAGA GGCTAGCTACAACGA CCTGTCCA	3766
1279	AUCUGAAA A UGGACUGC	1392	GCAGTCCA GGCTAGCTACAACGA TTTCAGAT	3767
1283	GAAAAUGG A CUGCAAGG	1393	CCTTGCAG GGCTAGCTACAACGA CCATTTTC	3768
1298	GGAGUACA A CUAUGACA	1394	TGTCATAG GGCTAGCTACAACGA TGTACTCC	3769
1304	CAACUAUG A CAAGAGCA	1395	TGCTCTTG GGCTAGCTACAACGA CATAGTTG	3770
1319	CAUUGUGG A CAGUGGCA	1396	TGCCACTG GGCTAGCTACAACGA CCACAATG	3771
1334	CACCACCA A CCUUCGUU	1397	AACGAAGG GGCTAGCTACAACGA TGGTGGTG	3772
1374	GCAGUCAA A UCCAUCAA	1398	TTGATGGA GGCTAGCTACAACGA TTGACTGC	3773
1412	GUUCCCUG A UGGUUUCU	1399	AGAAACCA GGCTAGCTACAACGA CAGGGAAC	3774
1469	CCCUUGGA A CAUUUUCC	1400	GGAAAATG GGCTAGCTACAACGA TCCAAGGG	3775
1498	UCUACCUA A UGGGUGAG	1401	CTCACCCA GGCTAGCTACAACGA TAGGTAGA	3776
1514	GGUUACCA A CCAGUCCU	1402	AGGACTGG GGCTAGCTACAACGA TGGTAACC	3777
1548	CCGCAGCA A UACCUGCG	1403	CGCAGGTA GGCTAGCTACAACGA TGCTGCGG	3778
1568	AGUGGAAG A UGUGGCCA	1404	TGGCCACA GGCTAGCTACAACGA CTTCCACT	3779
1586	GUCCCAAG A CGACUGUU	1405	AACAGTCG GGCTAGCTACAACGA CTTGGGAC	3780
1589	CCAAGACG A CUGUUACA	1406	TGTAACAG GGCTAGCTACAACGA CGTCTTGG	3781
1673	UGUCUUUG A UCGGGCCC	1407	GGGCCCGA GGCTAGCTACAACGA CAAAGACA	3782
1686	GCCCGAAA A CGAAUUGG	1408	CCAATTCG GGCTAGCTACAACGA TTTCGGGC	3783
1690	GAAAACGA A UUGGCUUU	1409	AAAGCCAA GGCTAGCTACAACGA TCGTTTTC	3784
1724	UGUGCACG A UGAGUUCA	1410	TGAACTCA GGCTAGCTACAACGA CGTGCACA	3785
1735	AGUUCAGG A CGGCAGCG	1411	CGCTGCCG GGCTAGCTACAACGA CCTGAACT	3786
1769	CACCUUGG A CAUGGAAG	1412	CTTCCATG GGCTAGCTACAACGA CCAAGGTG	3787
1778	CAUGGAAG A CUGUGGCU	1413	AGCCACAG GGCTAGCTACAACGA CTTCCATG	3788
1790	UGGCUACA A CAUUCCAC	1414	GTGGAATG GGCTAGCTACAACGA TGTAGCCA	3789
1801	UUCCACAG A CAGAUGAG	1415	CTCATCTG GGCTAGCTACAACGA CTGTGGAA	3790
1805	ACAGACAG A UGAGUCAA	1416	TTGACTCA GGCTAGCTACAACGA CTGTCTGT	3791
1813	AUGAGUCA A CCCUCAUG	1417	CATGAGGG GGCTAGCTACAACGA TGACTCAT	3792
1822	CCCUCAUG A CCAUAGCC	1418	GGCTATGG GGCTAGCTACAACGA CATGAGGG	3793
1925	GCAGCAUG A UGACUUUG	1419	CAAAGTCA GGCTAGCTACAACGA CATGCTGC	3794
1928	GCAUGAUG A CUUUGCUG	1420	CAGCAAAG GGCTAGCTACAACGA CATCATGC	3795
1937	CUUUGCUG A UGACAUCU	1421	AGATGTCA GGCTAGCTACAACGA CAGCAAAG	3796
1940	UGCUGAUG A CAUCUCCC	1422	GGGAGATG GGCTAGCTACAACGA CATCAGCA	3797
1979	GGCAGAAG A UAGAGAUU	1423	AATCTCTA GGCTAGCTACAACGA CTTCTGCC	3798
1985	AGAUAGAG A UUCCCCUG	1424	CAGGGGAA GGCTAGCTACAACGA CTCTATCT	3799
1995	UCCCCUGG A CCACACCU	1425	AGGTGTGG GGCTAGCTACAACGA CCAGGGGA	3800
2033	AGUAGGAG A CACAGAUG	1426	CATCTGTG GGCTAGCTACAACGA CTCCTACT	3801
2039	AGACACAG A UGGCACCU	1427	AGGTGCCA GGCTAGCTACAACGA CTGTGTCT	3802
2067	ACCUCAGG A CCCUCCCC	1428	GGGGAGGG GGCTAGCTACAACGA CCTGAGGT	3803
2085	CCCACCAA A UGCCUCUG	1429	CAGAGGCA GGCTAGCTACAACGA TTGGTGGG	3804
2099	CUGCCUUG A UGGAGAAG	1430	CTTCTCCA GGCTAGCTACAACGA CAAGGCAG	3805
2136	UUCCAGGG A CUGUACCU	1431	AGGTACAG GGCTAGCTACAACGA CCCTGGAA	3806
2152	UGUAGGAA A CAGAAAAG	1432	CTTTTCTG GGCTAGCTACAACGA TTCCTACA	3807
2189	UGGCGGGA A UACUCUUG	1433	CAAGAGTA GGCTAGCTACAACGA TCCCGCCA	3808
2208	CACCUCAA A UUUAAGUC	1434	GACTTAAA GGCTAGCTACAACGA TTGAGGTG	3809
2222	GUCGGGAA A UUCUGCUG	1435	CAGCAGAA GGCTAGCTACAACGA TTCCCGAC	3810
2237	UGCUUGAA A CUUCAGCC	1436	GGCTGAAG GGCTAGCTACAACGA TTCAAGCA	3811
2250	AGCCCUGA A CCUUUGUC	1437	GACAAAGG GGCTAGCTACAACGA TCAGGGCT	3812
2273	UCCUUUAA A UUCUCCAA	1438	TTGGAGAA GGCTAGCTACAACGA TTAAAGGA	3813
2281	AUUCUCCA A CCCAAAGU	1439	ACTTTGGG GGCTAGCTACAACGA TGGAGAAT	3814
2376	GAGAAGAG A CCAAGCUU	1440	AAGCTTGG GGCTAGCTACAACGA CTCTTCTC	3815

Table 22

2417	AGGAGAGG A UGCACAGU	1441	ACTGTGCA GGCTAGCTACAACGA CCTCTCCT	3816
2444	CUUUAGAG A CAGGGACU	1442	AGTCCCTG GGCTAGCTACAACGA CTCTAAAG	3817
2450	AGACAGGG A CUGUAUAA	1443	TTATACAG GGCTAGCTACAACGA CCCTGTCT	3818
2459	CUGUAUAA A CAAGCCUA	1444	TAGGCTTG GGCTAGCTACAACGA TTATACAG	3819
2468	CAAGCCUA A CAUUGGUG	1445	CACCAATG GGCTAGCTACAACGA TAGGCTTG	3820
2482	GUGCAAAG A UUGCCUCU	1446	AGAGGCAA GGCTAGCTACAACGA CTTTGCAC	3821
2494	CCUCUUGA A UUAAAAAA	1447	TTTTTTAA GGCTAGCTACAACGA TCAAGAGG	3822
2507	AAAAAAAA A CUAGAAAA	1448	TTTTCTAG GGCTAGCTACAACGA TTTTTTTT	3823

Input Sequence = AF190725. Cut Site = G/.
Stem Length = 8 . Core Sequence = GGCTAGCTACAACGA
AF190725 (Homo sapiens beta-site APP cleaving enzyme (BACE) mRNA; 2526 bp)

Table 23

Table 23: Human BACE Amberzyme Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
11	ACGCGUCC G CAGCCCGC	960	GCGGGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGACGCGU	3260
18	CGCAGCCC G CCCGGGAG	961	CUCCCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCUGCG	3261
29	CGGGAGCU G CGAGCCGC	962	GCGGCUCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUCCCG	3262
31	GGAGCUGC G AGCCGCGA	963	UCGCGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGCUCC	3263
36	UGCGAGCC G CGAGCUGG	964	CCAGCUCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCUCGCA	3264
38	CGAGCCGC G AGCUGGAU	965	AUCCAGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGGCUCG	3265
58	GGUGGCCU G AGCAGCCA	966	UGGCUGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGCCACC	3266
69	CAGCCAAC G CAGCCGCA	967	UGCGGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUGGCUG	3267
75	ACGCAGCC G CAGGAGCC	968	GGCUCCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCUGCGU	3268
94	GAGCCCUU G CCCCUGCC	969	GGCAGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGGCUC	3269
100	UUGCCCCU G CCCGCGCC	970	GGCGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGCAA	3270
104	CCCUGCCC G CGCCGCCG	971	CGGCGGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCAGGG	3271
106	CUGCCCGC G CCGCCGCC	972	GGCGGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGGGCAG	3272
109	CCCGCGCC G CCGCCCGC	973	GCGGGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCGCGGG	3273
112	GCGCCGCC G CCCGCCGG	974	CCGGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCGGCGC	3274
116	CGCCGCCC G CCGGGGGG	975	CCCCCCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCGGCG	3275
137	GGGAAGCC G CCACCGGC	976	GCCGGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCUUCCC	3276
148	ACCGGCCC G CCAUGCCC	977	GGGCAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCCGGU	3277
153	CCCGCCAU G CCCGCCCC	978	GGGGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGCGGG	3278
157	CCAUGCCC G CCCCUCCC	979	GGGAGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCAUGG	3279
172	CCAGCCCC G CCGGGAGC	980	GCUCCCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGGCUGG	3280
183	GGGAGCCC G CGCCCGCU	981	AGCGGGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCUCCC	3281
185	GAGCCCGC G CCCGCUGC	982	GCAGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGGGCUC	3282
189	CCGCGCCC G CUGCCCAG	983	CUGGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCGCGG	3283
192	CGCCCGCU G CCCAGGCU	984	AGCCUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCGGGCG	3284
205	GGCUGGCC G CCGCCGUG	985	CACGGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCCAGCC	3285
208	UGGCCGCC G CCGUGCCG	986	CGGCACGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCGGCCA	3286
213	GCCGCCGU G CCGAUGUA	987	UACAUCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGGCGGC	3287
216	GCCGUGCC G AUGUAGCG	988	CGCUACAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCACGGC	3288
250	UCUCCCCU G CUCCCGUG	989	CACGGGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGAGA	3289

Table 23

258	GCUCCCGU G CUCUGCGG	990	CCGCAGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGGGAGC	3290
263	CGUGCUCU G CGGAUCUC	991	GAGAUCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGCACG	3291
276	UCUCCCCU G ACCGCUCU	992	AGAGCGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGAGA	3292
280	CCCUGACC G CUCUCCAC	993	GUGGAGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUCAGGG	3293
320	AGGGCCCU G CAGGCCCU	994	AGGGCCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGCCCU	3294
337	GGCGUCCU G AUGCCCCC	995	GGGGGCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGACGCC	3295
340	GUCCUGAU G CCCCCAAG	996	CUUGGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAGGAC	3296
360	CCUCUCCU G AGAAGCCA	997	UGGCUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAGAGG	3297
397	GGGCAGGC G CCAGGGAC	998	GUCCCUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCUGCCC	3298
420	GGGCCAGU G CGAGCCCA	999	UGGGCUCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGGCCC	3299
422	GCCAGUGC G AGCCCAGA	1000	UCUGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCACUGGC	3300
437	GAGGGCCC G AAGGCCGG	1001	CCGGCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCCCUC	3301
468	CAAGCCCU G CCCUGGCU	1002	AGCCAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGCUUG	3302
480	UGGCUCCU G CUGUGGAU	1003	AUCCACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAGCCA	3303
493	GGAUGGGC G CGGGAGUG	1004	CACUCCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCCAUCC	3304
501	GCGGGAGU G CUGCCUGC	1005	GCAGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUCCCGC	3305
504	GGAGUGCU G CCUGCCCA	1006	UGGGCAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCACUCC	3306
508	UGCUGCCU G CCCACGGC	1007	GCCGUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGCAGCA	3307
537	AUCCGGCU G CCCCUGCG	1008	CGCAGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCGGAU	3308
543	CUGCCCCU G CGCAGCGG	1009	CCGCUGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGCAG	3309
545	GCCCCUGC G CAGCGGCC	1010	GGCCGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGGGGC	3310
562	UGGGGGGC G CCCCCCUG	1011	CAGGGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCCCCCA	3311
576	CUGGGGCU G CGGCUGCC	1012	GGCAGCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCCCAG	3312
582	CUGCGGCU G CCCCGGGA	1013	UCCCGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCGCAG	3313
595	GGGAGACC G ACGAAGAG	1014	CUCUUCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUCUCCC	3314
598	AGACCGAC G AAGAGCCC	1015	GGGCUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCGGUCU	3315
607	AAGAGCCC G AGGAGCCC	1016	GGGCUCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCUCUU	3316
654	GACAACCU G AGGGGCAA	1017	UUGCCCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUUGUC	3317
690	GUGGAGAU G ACCGUGGG	1018	CCCACGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUCCAC	3318
708	AGCCCCCC G CAGACGCU	1019	AGCGUCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGGGGCU	3319
714	CCGCAGAC G CUCAACAU	1020	AUGUUGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCUGCGG	3320
751	GUAACUUU G CAGUGGGU	1021	ACCCACUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGUUAC	3321
760	CAGUGGGU G CUGCCCCC	1022	GGGGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCACUG	3322
763	UGGGUGCU G CCCCCCAC	1023	GUGGGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCACCCA	3323

Table 23

780	CCCUUCCU G CAUCGCUA	1024	UAGCGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAAGGG	3324
785	CCUGCAUC G CUACUACC	1025	GGUAGUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUGCAGG	3325
843	GUGUAUGU G CCCUACAC	1026	GUGUAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUACAC	3326
883	UGGGCACC G ACCUGGUA	1027	UACCAGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUGCCCA	3327
921	GUCACUGU G CGUGCCAA	1028	UUGGCACG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGUGAC	3328
925	CUGUGCGU G CCAACAUU	1029	AAUGUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGCACAG	3329
934	CCAACAUU G CUGCCAUC	1030	GAUGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGUUGG	3330
937	ACAUUGCU G CCAUCACU	1031	AGUGAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAAUGU	3331
946	CCAUCACU G AAUCAGAC	1032	GUCUGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGAUGG	3332
1006	UGGCCUAU G CUGAGAUU	1033	AAUCUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGGCCA	3333
1009	CCUAUGCU G AGAUUGCC	1034	GGCAAUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAUAGG	3334
1015	CUGAGAUU G CCAGGCCU	1035	AGGCCUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUCUCAG	3335
1024	CCAGGCCU G ACGACUCC	1036	GGAGUCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGCCUGG	3336
1027	GGCCUGAC G ACUCCCUG	1037	CAGGGAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCAGGCC	3337
1048	CUUUCUUU G ACUCUCUG	1038	CAGAGAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGAAAG	3338
1092	UUCUCCCU G CAGCUUUG	1039	CAAAGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGAGAA	3339
1105	UUUGUGGU G CUGGCUUC	1040	GAAGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCACAAA	3340
1129	ACCAGUCU G AAGUGCUG	1041	CAGCACUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGACUGGU	3341
1134	UCUGAAGU G CUGGCCUC	1042	GAGGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUUCAGA	3342
1158	GGGAGCAU G AUCAUUGG	1043	CCAAUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCUCCC	3343
1174	GAGGUAUC G ACCACUCG	1044	CGAGUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUACCUC	3344
1182	GACCACUC G CUGUACAC	1045	GUGUACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGUGGUC	3345
1234	GGUAUUAU G AGGUGAUC	1046	GAUCACCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAAUACC	3346
1239	UAUGAGGU G AUCAUUGU	1047	ACAAUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCUCAUA	3347
1248	AUCAUUGU G CGGGUGGA	1048	UCCACCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAUGAU	3348
1275	CAGGAUCU G AAAAUGGA	1049	UCCAUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUCCUG	3349
1286	AAUGGACU G CAAGGAGU	1050	ACUCCUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCCAUU	3350
1303	ACAACUAU G ACAAGAGC	1051	GCUCUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGUUGU	3351
1344	CUUCGUUU G CCCAAGAA	1052	UUCUUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAACGAAG	3352
1360	AAGUGUUU G AAGCUGCA	1053	UGCAGCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAACACUU	3353
1366	UUGAAGCU G CAGUCAAA	1054	UUUGACUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUUCAA	3354
1411	AGUUCCCU G AUGGUUUC	1055	GAAACCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGAACU	3355
1442	GCUGGUGU G CUGGCAAG	1056	CUUGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACCAGC	3356
1504	UAAUGGGU G AGGUUACC	1057	GGUAACCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCAUUA	3357

Table 23

1526	GUCCUUCC G CAUCACCA	1058	UGGUGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAAGGAC	3358
1542	AUCCUUCC G CAGCAAUA	1059	UAUUGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAAGGAU	3359
1554	CAAUACCU G CGGCCAGU	1060	ACUGGCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUAUUG	3360
1588	CCCAAGAC G ACUGUUAC	1061	GUAACAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCUUGGG	3361
1603	ACAAGUUU G CCAUCUCA	1062	UGAGAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAACUUGU	3362
1672	UUGUCUUU G AUCGGGCC	1063	GGCCCGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGACAA	3363
1682	UCGGGCCC G AAAACGAA	1064	UUCGUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCCCGA	3364
1688	CCGAAAAC G AAUUGGCU	1065	AGCCAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUUUCGG	3365
1699	UUGGCUUU G CUGUCAGC	1066	GCUGACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGCCAA	3366
1708	CUGUCAGC G CUUGCCAU	1067	AUGGCAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCUGACAG	3367
1712	CAGCGCUU G CCAUGUGC	1068	GCACAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGCGCUG	3368
1719	UGCCAUGU G CACGAUGA	1069	UCAUCGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUGGCA	3369
1723	AUGUGCAC G AUGAGUUC	1070	GAACUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGCACAU	3370
1726	UGCACGAU G AGUUCAGG	1071	CCUGAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCGUGCA	3371
1807	AGACAGAU G AGUCAACC	1072	GGUUGACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUGUCU	3372
1821	ACCCUCAU G ACCAUAGC	1073	GCUAUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAGGGU	3373
1843	UCAUGGCU G CCAUCUGC	1074	GCAGAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCAUGA	3374
1850	UGCCAUCU G CGCCCUCU	1075	AGAGGGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUGGCA	3375
1852	CCAUCUGC G CCCUCUUC	1076	GAAGAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGAUGG	3376
1863	CUCUUCAU G CUGCCACU	1077	AGUGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAAGAG	3377
1866	UUCAUGCU G CCACUCUG	1078	CAGAGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAUGAA	3378
1874	GCCACUCU G CCUCAUGG	1079	CCAUGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGUGGC	3379
1895	UCAGUGGC G CUGCCUCC	1080	GGAGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCACUGA	3380
1898	GUGGCGCU G CCUCCGCU	1081	AGCGGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCGCCAC	3381
1904	CUGCCUCC G CUGCCUGC	1082	GCAGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAGGCAG	3382
1907	CCUCCGCU G CCUGCGCC	1083	GGCGCAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCGGAGG	3383
1911	CGCUGCCU G CGCCAGCA	1084	UGCUGGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGCAGCG	3384
1913	CUGCCUGC G CCAGCAGC	1085	GCUGCUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGGCAG	3385
1924	AGCAGCAU G AUGACUUU	1086	AAAGUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCUGCU	3386
1927	AGCAUGAU G ACUUUGCU	1087	AGCAAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAUGCU	3387
1933	AUGACUUU G CUGAUGAC	1088	GUCAUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGUCAU	3388
1936	ACUUUGCU G AUGACAUC	1089	GAUGUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAAAGU	3389
1939	UUGCUGAU G ACAUCUCC	1090	GGAGAUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAGCAA	3390
1950	AUCUCCCU G CUGAAGUG	1091	CACUUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGAGAU	3391

Table 23

1953	UCCCUGCU G AAGUGAGG	1092	CCUCACUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGGGA	3392
1958	GCUGAAGU G AGGAGGCC	1093	GGCCUCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUUCAGC	3393
2087	CACCAAAU G CCUCUGCC	1094	GGCAGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUGGUG	3394
2093	AUGCCUCU G CCUUGAUG	1095	CAUCAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGGCAU	3395
2098	UCUGCCUU G AUGGAGAA	1096	UUCUCCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGCAGA	3396
2179	AGCACUCU G CUGGCGGG	1097	CCCGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGUGCU	3397
2227	GAAAUUCU G CUGCUUGA	1098	UCAAGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAUUUC	3398
2230	AUUCUGCU G CUUGAAAC	1099	GUUUCAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGAAU	3399
2234	UGCUGCUU G AAACUUCA	1100	UGAAGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGCAGCA	3400
2248	UCAGCCCU G AACCUUUG	1101	CAAAGGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGCUGA	3401
2329	CAUCACAC G CAGGUUAC	1102	GUAACCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGUGAUG	3402
2393	GUUUCCCU G CUGGCCAA	1103	UUGGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGAAAC	3403
2419	GAGAGGAU G CACAGUUU	1104	AAACUGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCCUCUC	3404
2428	CACAGUUU G CUAUUUGC	1105	GCAAAUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAACUGUG	3405
2435	UGCUAUUU G CUUUAGAG	1106	CUCUAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUAGCA	3406
2476	ACAUUGGU G CAAAGAUU	1107	AAUCUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAAUGU	3407
2485	CAAAGAUU G CCUCUUGA	1108	UCAAGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUCUUUG	3408
2492	UGCCUCUU G AAUUAAAA	1109	UUUUAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAGGCA	3409
219	GUGCCGAU G UAGCGGGC	1110	GCCCGCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCGGCAC	3410
483	CUCCUGCU G UGGAUGGG	1111	CCCAUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGGAG	3411
634	GCAGCUUU G UGGAGAUG	1112	CAUCUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGCUGC	3412
804	AGGCAGCU G UCCAGCAC	1113	GUGCUGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUGCCU	3413
835	GGAAGGGU G UGUAUGUG	1114	CACAUACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCUUCC	3414
837	AAGGGUGU G UAUGUGCC	1115	GGCACAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACCCUU	3415
841	GUGUGUAU G UGCCCUAC	1116	GUAGGGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUACACAC	3416
919	ACGUCACU G UGCGUGCC	1117	GGCACGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGACGU	3417
1100	GCAGCUUU G UGGUGCUG	1118	CAGCACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGCUGC	3418
1144	UGGCCUCU G UCGGAGGG	1119	CCCUCCGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGGCCA	3419
1185	CACUCGCU G UACACAGG	1120	CCUGUGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCGAGUG	3420
1246	UGAUCAUU G UGCGGGUG	1121	CACCCGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGAUCA	3421
1315	AGAGCAUU G UGGACAGU	1122	ACUGUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGCUCU	3422
1356	AAGAAAGU G UUUGAAGC	1123	GCUUCAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUUUCUU	3423
1440	CAGCUGGU G UGCUGGCA	1124	UGCCAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAGCUG	3424
1570	UGGAAGAU G UGGCCACG	1125	CGUGGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUUCCA	3425

Table 23

1592	AGACGACU G UUACAAGU	1126	ACUUGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCGUCU	3426
1630	CGGGCACU G UUAUGGGA	1127	UCCCAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGCCCG	3427
1642	UGGGAGCU G UUAUCAUG	1128	CAUGAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUCCCA	3428
1666	UCUACGUU G UCUUUGAU	1129	AUCAAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACGUAGA	3429
1702	GCUUUGCU G UCAGCGCU	1130	AGCGCUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAAAGC	3430
1717	CUUGCCAU G UGCACGAU	1131	AUCGUGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGCAAG	3431
1759	GCCCUUUU G UCACCUUG	1132	CAAGGUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAGGGC	3432
1781	GGAAGACU G UGGCUACA	1133	UGUAGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCUUCC	3433
1834	UAGCCUAU G UCAUGGCU	1134	AGCCAUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGGCUA	3434
1884	CUCAUGGU G UGUCAGUG	1135	CACUGACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAUGAG	3435
1886	CAUGGUGU G UCAGUGGC	1136	GCCACUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACCAUG	3436
2048	UGGCACCU G UGGCCAGA	1137	UCUGGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUGCCA	3437
2139	CAGGGACU G UACCUGUA	1138	UACAGGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCCCUG	3438
2145	CUGUACCU G UAGGAAAC	1139	GUUUCCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUACAG	3439
2256	GAACCUUU G UCCACCAU	1140	AUGGUGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGGUUC	3440
2346	CUUGGCGU G UGUCCCUG	1141	CAGGGACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGCCAAG	3441
2348	UGGCGUGU G UCCCUGUG	1142	CACAGGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACGCCA	3442
2354	GUGUCCCU G UGGUACCC	1143	GGGUACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGACAC	3443
2385	CCAAGCUU G UUUCCCUG	1144	CAGGGAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGCUUGG	3444
2453	CAGGGACU G UAUAAACA	1145	UGUUUAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCCCUG	3445
14	CGUCCGCA G CCCGCCCG	1146	CGGGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGGACG	3446
26	GCCCGGGA G CUGCGAGC	1147	GCUCGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCGGGC	3447
33	AGCUGCGA G CCGCGAGC	1148	GCUCGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCGCAGCU	3448
40	AGCCGCGA G CUGGAUUA	1149	UAAUCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCGCGGCU	3449
51	GGAUUAUG G UGGCCUGA	1150	UCAGGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUAAUCC	3450
54	UUAUGGUG G CCUGAGCA	1151	UGCUCAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCAUAA	3451
60	UGGCCUGA G CAGCCAAC	1152	GUUGGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAGGCCA	3452
63	CCUGAGCA G CCAACGCA	1153	UGCGUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUCAGG	3453
72	CCAACGCA G CCGCAGGA	1154	UCCUGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGUUGG	3454
81	CCGCAGGA G CCCGGAGC	1155	GCUCCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUGCGG	3455
88	AGCCCGGA G CCCUUGCC	1156	GGCAAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCGGGCU	3456
134	CCAGGGAA G CCGCCACC	1157	GGUGGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCCUGG	3457
144	CGCCACCG G CCCGCCAU	1158	AUGGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGUGGCG	3458
167	CCCUCCCA G CCCCGCCG	1159	CGGCGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGAGGG	3459

Table 23

179	CGCCGGGA G CCCGCGCC	1160	GGCGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCGGCG	3460
198	CUGCCCAG G CUGGCCGC	1161	GCGGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGGCAG	3461
202	CCAGGCUG G CCGCCGCC	1162	GGCGGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCCUGG	3462
211	CCGCCGCC G UGCCGAUG	1163	CAUCGGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCGGCGG	3463
222	CCGAUGUA G CGGGCUCC	1164	GGAGCCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACAUCGG	3464
226	UGUAGCGG G CUCCGGAU	1165	AUCCGGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCUACA	3465
239	GGAUCCCA G CCUCUCCC	1166	GGGAGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGAUCC	3466
256	CUGCUCCC G UGCUCUGC	1167	GCAGAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGAGCAG	3467
290	UCUCCACA G CCCGGACC	1168	GGUCCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGGAGA	3468
304	ACCCGGGG G CUGGCCCA	1169	UGGGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCGGGU	3469
308	GGGGGCUG G CCCAGGGC	1170	GCCCUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCCCCC	3470
315	GGCCCAGG G CCCUGCAG	1171	CUGCAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGGGCC	3471
324	CCCUGCAG G CCCUGGCG	1172	CGCCAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCAGGG	3472
330	AGGCCCUG G CGUCCUGA	1173	UCAGGACG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGGCCU	3473
332	GCCCUGGC G UCCUGAUG	1174	CAUCAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCAGGGC	3474
348	GCCCCCAA G CUCCCUCU	1175	AGAGGGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGGGGC	3475
365	CCUGAGAA G CCACCAGC	1176	GCUGGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUCAGG	3476
372	AGCCACCA G CACCACCC	1177	GGGUGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGUGGCU	3477
391	ACUUGGGG G CAGGCGCC	1178	GGCGCCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCAAGU	3478
395	GGGGGCAG G CGCCAGGG	1179	CCCUGGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCCCCC	3479
410	GGACGGAC G UGGGCCAG	1180	CUGGCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCCGUCC	3480
414	GGACGUGG G CCAGUGCG	1181	CGCACUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACGUCC	3481
418	GUGGGCCA G UGCGAGCC	1182	GGCUCGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCCCAC	3482
424	CAGUGCGA G CCCAGAGG	1183	CCUCUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCGCACUG	3483
433	CCCAGAGG G CCCGAAGG	1184	CCUUCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUCUGGG	3484
441	GCCCGAAG G CCGGGGCC	1185	GGCCCCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCGGGC	3485
447	AGGCCGGG G CCCACCAU	1186	AUGGUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGGCCU	3486
457	CCACCAUG G CCCAAGCC	1187	GGCUUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGGUGG	3487
463	UGGCCCAA G CCCUGCCC	1188	GGGCAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGGCCA	3488
474	CUGCCCUG G CUCCUGCU	1189	AGCAGGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGGCAG	3489
491	GUGGAUGG G CGCGGGAG	1190	CUCCCGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUCCAC	3490
499	GCGCGGGA G UGCUGCCU	1191	AGGCAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCGCGC	3491
515	UGCCCACG G CACCCAGC	1192	GCUGGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUGGGCA	3492
522	GGCACCCA G CACGGCAU	1193	AUGCCGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGUGCC	3493

Table 23

527	CCAGCACG G CAUCCGGC	1194	GCCGGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUGCUGG	3494
534	GGCAUCCG G CUGCCCCU	1195	AGGGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGAUGCC	3495
548	CCUGCGCA G CGGCCUGG	1196	CCAGGCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGCAGG	3496
551	GCGCAGCG G CCUGGGGG	1197	CCCCCAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCUGCGC	3497
560	CCUGGGGG G CGCCCCCC	1198	GGGGGGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCCAGG	3498
573	CCCCUGGG G CUGCGGCU	1199	AGCCGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAGGGG	3499
579	GGGCUGCG G CUGCCCCG	1200	CGGGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCAGCCC	3500
603	GACGAAGA G CCCGAGGA	1201	UCCUCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUCGUC	3501
612	CCCGAGGA G CCCGGCCG	1202	CGGCCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUCGGG	3502
617	GGAGCCCG G CCGGAGGG	1203	CCCUCCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGGCUCC	3503
626	CCGGAGGG G CAGCUUUG	1204	CAAAGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCUCCGG	3504
629	GAGGGGCA G CUUUGUGG	1205	CCACAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCCCUC	3505
643	UGGAGAUG G UGGACAAC	1206	GUUGUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUCUCCA	3506
659	CCUGAGGG G CAAGUCGG	1207	CCGACUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCUCAGG	3507
663	AGGGGCAA G UCGGGGCA	1208	UGCCCCGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGCCCCU	3508
669	AAGUCGGG G CAGGGCUA	1209	UAGCCCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGACUU	3509
674	GGGGCAGG G CUACUACG	1210	CGUAGUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGCCCC	3510
682	GCUACUAC G UGGAGAUG	1211	CAUCUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAGUAGC	3511
694	AGAUGACC G UGGGCAGC	1212	GCUGCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUCAUCU	3512
698	GACCGUGG G CAGCCCCC	1213	GGGGGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACGGUC	3513
701	CGUGGGCA G CCCCCCGC	1214	GCGGGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCCACG	3514
727	ACAUCCUG G UGGAUACA	1215	UGUAUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGAUGU	3515
737	GGAUACAG G CAGCAGUA	1216	UACUGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUAUCC	3516
740	UACAGGCA G CAGUAACU	1217	AGUUACUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCUGUA	3517
743	AGGCAGCA G UAACUUUG	1218	CAAAGUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUGCCU	3518
754	ACUUUGCA G UGGGUGCU	1219	AGCACCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAAAGU	3519
758	UGCAGUGG G UGCUGCCC	1220	GGGCAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACUGCA	3520
798	UACCAGAG G CAGCUGUC	1221	GACAGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCUGGUA	3521
801	CAGAGGCA G CUGUCCAG	1222	CUGGACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCUCUG	3522
809	GCUGUCCA G CACAUACC	1223	GGUAUGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGACAGC	3523
833	CCGGAAGG G UGUGUAUG	1224	CAUACACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUUCCGG	3524
857	CACCCAGG G CAAGUGGG	1225	CCCACUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGGGUG	3525
861	CAGGGCAA G UGGGAAGG	1226	CCUUCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGCCCUG	3526
873	GAAGGGGA G CUGGGCAC	1227	GUGCCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCCUUC	3527

Table 23

878	GGAGCUGG G CACCGACC	1228	GGUCGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGCUCC	3528
889	CCGACCUG G UAAGCAUC	1229	GAUGCUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGUCGG	3529
893	CCUGGUAA G CAUCCCCC	1230	GGGGGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUACCAGG	3530
905	CCCCCAUG G CCCCAACG	1231	CGUUGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGGGGG	3531
913	GCCCCAAC G UCACUGUG	1232	CACAGUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUGGGGC	3532
923	CACUGUGC G UGCCAACA	1233	UGUUGGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCACAGUG	3533
957	UCAGACAA G UUCUUCAU	1234	AUGAAGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUCUGA	3534
971	CAUCAACG G CUCCAACU	1235	AGUUGGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUUGAUG	3535
986	CUGGGAAG G CAUCCUGG	1236	CCAGGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCCCAG	3536
996	AUCCUGGG G CUGGCCUA	1237	UAGGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAGGAU	3537
1000	UGGGGCUG G CCUAUGCU	1238	AGCAUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCCCCA	3538
1020	AUUGCCAG G CCUGACGA	1239	UCGUCAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGCAAU	3539
1038	UCCCUGGA G CCUUUCUU	1240	AAGAAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAGGGA	3540
1057	ACUCUCUG G UAAAGCAG	1241	CUGCUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGAGAGU	3541
1062	CUGGUAAA G CAGACCCA	1242	UGGGUCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUACCAG	3542
1072	AGACCCAC G UUCCCAAC	1243	GUUGGGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGGGUCU	3543
1095	UCCCUGCA G CUUUGUGG	1244	CCACAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAGGGA	3544
1103	GCUUUGUG G UGCUGGCU	1245	AGCCAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAAAGC	3545
1109	UGGUGCUG G CUUCCCCC	1246	GGGGGAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCACCA	3546
1125	CUCAACCA G UCUGAAGU	1247	ACUUCAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGUUGAG	3547
1132	AGUCUGAA G UGCUGGCC	1248	GGCCAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCAGACU	3548
1138	AAGUGCUG G CCUCUGUC	1249	GACAGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCACUU	3549
1154	CGGAGGGA G CAUGAUCA	1250	UGAUCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCUCCG	3550
1169	CAUUGGAG G UAUCGACC	1251	GGUCGAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCAAUG	3551
1193	GUACACAG G CAGUCUCU	1252	AGAGACUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUGUAC	3552
1196	CACAGGCA G UCUCUGGU	1253	ACCAGAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCUGUG	3553
1203	AGUCUCUG G UAUACACC	1254	GGUGUAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGAGACU	3554
1218	CCCAUCCG G CGGGAGUG	1255	CACUCCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGAUGGG	3555
1224	CGGCGGGA G UGGUAUUA	1256	UAAUACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCGCCG	3556
1227	CGGGAGUG G UAUUAUGA	1257	UCAUAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUCCCG	3557
1237	AUUAUGAG G UGAUCAUU	1258	AAUGAUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCAUAAU	3558
1252	UUGUGCGG G UGGAGAUC	1259	GAUCUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCACAA	3559
1293	UGCAAGGA G UACAACUA	1260	UAGUUGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUUGCA	3560
1310	UGACAAGA G CAUUGUGG	1261	CCACAAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUGUCA	3561

Table 23

1322	UGUGGACA G UGGCACCA	1262	UGGUGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCCACA	3562
1325	GGACAGUG G CACCACCA	1263	UGGUGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUGUCC	3563
1340	CAACCUUC G UUUGCCCA	1264	UGGGCAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAAGGUUG	3564
1354	CCAAGAAA G UGUUUGAA	1265	UUCAAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUCUUGG	3565
1363	UGUUUGAA G CUGCAGUC	1266	GACUGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCAAACA	3566
1369	AAGCUGCA G UCAAAUCC	1267	GGAUUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAGCUU	3567
1384	CCAUCAAG G CAGCCUCC	1268	GGAGGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGAUGG	3568
1387	UCAAGGCA G CCUCCUCC	1269	GGAGGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCUUGA	3569
1404	ACGGAGAA G UUCCCUGA	1270	UCAGGGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUCCGU	3570
1415	CCCUGAUG G UUUCUGGC	1271	GCCAGAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUCAGGG	3571
1422	GGUUUCUG G CUAGGAGA	1272	UCUCCUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGAAACC	3572
1431	CUAGGAGA G CAGCUGGU	1273	ACCAGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUCCUAG	3573
1434	GGAGAGCA G CUGGUGUG	1274	CACACCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUCUCC	3574
1438	AGCAGCUG G UGUGCUGG	1275	CCAGCACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCUGCU	3575
1446	GUGUGCUG G CAAGCAGG	1276	CCUGCUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCACAC	3576
1450	GCUGGCAA G CAGGCACC	1277	GGUGCCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGCCAGC	3577
1454	GCAAGCAG G CACCACCC	1278	GGGUGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCUUGC	3578
1480	UUUUCCCA G UCAUCUCA	1279	UGAGAUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGAAAA	3579
1502	CCUAAUGG G UGAGGUUA	1280	UAACCUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUUAGG	3580
1507	UGGGUGAG G UUACCAAC	1281	GUUGGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCACCCA	3581
1518	ACCAACCA G UCCUUCCG	1282	CGGAAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGUUGGU	3582
1545	CUUCCGCA G CAAUACCU	1283	AGGUAUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGGAAG	3583
1557	UACCUGCG G CCAGUGGA	1284	UCCACUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCAGGUA	3584
1561	UGCGGCCA G UGGAAGAU	1285	AUCUUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCCGCA	3585
1573	AAGAUGUG G CCACGUCC	1286	GGACGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAUCUU	3586
1578	GUGGCCAC G UCCCAAGA	1287	UCUUGGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGGCCAC	3587
1599	UGUUACAA G UUUGCCAU	1288	AUGGCAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUAACA	3588
1614	AUCUCACA G UCAUCCAC	1289	GUGGAUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGAGAU	3589
1625	AUCCACGG G CACUGUUA	1290	UAACAGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGUGGAU	3590
1639	UUAUGGGA G CUGUUAUC	1291	GAUAACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCAUAA	3591
1655	CAUGGAGG G CUUCUACG	1292	CGUAGAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUCCAUG	3592
1663	GCUUCUAC G UUGUCUUU	1293	AAAGACAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAGAAGC	3593
1678	UUGAUCGG G CCCGAAAA	1294	UUUUCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGAUCAA	3594
1694	ACGAAUUG G CUUUGCUG	1295	CAGCAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAUUCGU	3595

Table 23

1706	UGCUGUCA G CGCUUGCC	1296	GGCAAGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGACAGCA	3596
1728	CACGAUGA G UUCAGGAC	1297	GUCCUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAUCGUG	3597
1738	UCAGGACG G CAGCGGUG	1298	CACCGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUCCUGA	3598
1741	GGACGGCA G CGGUGGAA	1299	UUCCACCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCGUCC	3599
1744	CGGCAGCG G UGGAAGGC	1300	GCCUUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCUGCCG	3600
1751	GGUGGAAG G CCCUUUUG	1301	CAAAAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCCACC	3601
1784	AGACUGUG G CUACAACA	1302	UGUUGUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAGUCU	3602
1809	ACAGAUGA G UCAACCCU	1303	AGGGUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAUCUGU	3603
1828	UGACCAUA G CCUAUGUC	1304	GACAUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAUGGUCA	3604
1840	AUGUCAUG G CUGCCAUC	1305	GAUGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGACAU	3605
1882	GCCUCAUG G UGUGUCAG	1306	CUGACACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGAGGC	3606
1890	GUGUGUCA G UGGCGCUG	1307	CAGCGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGACACAC	3607
1893	UGUCAGUG G CGCUGCCU	1308	AGGCAGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUGACA	3608
1917	CUGCGCCA G CAGCAUGA	1309	UCAUGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCGCAG	3609
1920	CGCCAGCA G CAUGAUGA	1310	UCAUCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUGGCG	3610
1956	CUGCUGAA G UGAGGAGG	1311	CCUCCUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCAGCAG	3611
1964	GUGAGGAG G CCCAUGGG	1312	CCCAUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCUCAC	3612
1972	GCCCAUGG G CAGAAGAU	1313	AUCUUCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUGGGC	3613
2006	ACACCUCC G UGGUUCAC	1314	GUGAACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAGGUGU	3614
2009	CCUCCGUG G UUCACUUU	1315	AAAGUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACGGAGG	3615
2019	UCACUUUG G UCACAAGU	1316	ACUUGUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAGUGA	3616
2026	GGUCACAA G UAGGAGAC	1317	GUCUCCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUGACC	3617
2042	CACAGAUG G CACCUGUG	1318	CACAGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUCUGUG	3618
2051	CACCUGUG G CCAGAGCA	1319	UGCUCUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAGGUG	3619
2057	UGGCCAGA G CACCUCAG	1320	CUGAGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUGGCCA	3620
2114	AGGAAAAG G CUGGCAAG	1321	CUUGCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUUUCCU	3621
2118	AAAGGCUG G CAAGGUGG	1322	CCACCUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCCUUU	3622
2123	CUGGCAAG G UGGGUUCC	1323	GGAACCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGCCAG	3623
2127	CAAGGUGG G UUCCAGGG	1324	CCCUGGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACCUUG	3624
2172	AGAAAGAA G CACUCUGC	1325	GCAGAGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUUUCU	3625
2183	CUCUGCUG G CGGGAAUA	1326	UAUUCCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCAGAG	3626
2198	UACUCUUG G UCACCUCA	1327	UGAGGUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGAGUA	3627
2214	AAAUUUAA G UCGGGAAA	1328	UUUCCCGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAAAUUU	3628
2243	AAACUUCA G CCCUGAAC	1329	GUUCAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAAGUUU	3629

Table 23

2288	AACCCAAA G UAUUCUUC	1330	GAAGAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUGGGUU	3630
2305	UUUUCUUA G UUUCAGAA	1331	UUCUGAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAGAAAA	3631
2314	UUUCAGAA G UACUGGCA	1332	UGCCAGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUGAAA	3632
2320	AAGUACUG G CAUCACAC	1333	GUGUGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGUACUU	3633
2333	ACACGCAG G UUACCUUG	1334	CAAGGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCGUGU	3634
2342	UUACCUUG G CGUGUGUC	1335	GACACACG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGGUAA	3635
2344	ACCUUGGC G UGUGUCCC	1336	GGGACACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCAAGGU	3636
2357	UCCCUGUG G UACCCUGG	1337	CCAGGGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAGGGA	3637
2365	GUACCCUG G CAGAGAAG	1338	CUUCUCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGGUAC	3638
2381	GAGACCAA G CUUGUUUC	1339	GAAACAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGUCUC	3639
2397	CCCUGCUG G CCAAAGUC	1340	GACUUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCAGGG	3640
2403	UGGCCAAA G UCAGUAGG	1341	CCUACUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUGGCCA	3641
2407	CAAAGUCA G UAGGAGAG	1342	CUCUCCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGACUUUG	3642
2424	GAUGCACA G UUUGCUAU	1343	AUAGCAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGCAUC	3643
2463	AUAAACAA G CCUAACAU	1344	AUGUUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUUUAU	3644
2474	UAACAUUG G UGCAAAGA	1345	UCUUUGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAUGUUA	3645
22	GCCCGCCC G GGAGCUGC	1449	GCAGCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCGGGC	3646
23	CCCGCCCG G GAGCUGCG	1450	CGCAGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGGCGGG	3647
24	CCGCCCGG G AGCUGCGA	1451	UCGCAGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGGCGG	3648
43	CGCGAGCU G GAUUAUGG	1452	CCAUAAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUCGCG	3649
44	GCGAGCUG G AUUAUGGU	1453	ACCAUAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCUCGC	3650
50	UGGAUUAU G GUGGCCUG	1454	CAGGCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAAUCCA	3651
53	AUUAUGGU G GCCUGAGC	1455	GCUCAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAUAAU	3652
78	CAGCCGCA G GAGCCCGG	1456	CCGGGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGGCUG	3653
79	AGCCGCAG G AGCCCGGA	1457	UCCGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCGGCU	3654
85	AGGAGCCC G GAGCCCUU	1458	AAGGGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCUCCU	3655
86	GGAGCCCG G AGCCCUUG	1459	CAAGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGGCUCC	3656
119	CGCCCGCC G GGGGACC	1460	GGUCCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCGGGCG	3657
120	GCCCGCCG G GGGACCA	1461	UGGUCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGCGGGC	3658
121	CCCGCCGG G GGACCAG	1462	CUGGUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGCGGG	3659
122	CCGCCGGG G GGACCAGG	1463	CCUGGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGGCGG	3660
123	CGCCGGGG G GACCAGGG	1464	CCCUGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCGGCG	3661
124	GCCGGGGG G ACCAGGGA	1465	UCCCUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCCGGC	3662
129	GGGGACCA G GGAAGCCG	1466	CGGCUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGUCCCC	3663

Table 23

130	GGGACCAG G GAAGCCGC	1467	GCGGCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGUCCC	3664
131	GGACCAGG G AAGCCGCC	1468	GGCGGCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGGUCC	3665
143	CCGCCACC G GCCCGCCA	1469	UGGCGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUGGCGG	3666
175	GCCCCGCC G GGAGCCCG	1470	CGGGCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCGGGGC	3667
176	CCCCGCCG G GAGCCCGC	1471	GCGGGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGCGGGG	3668
177	CCCGCCGG G AGCCCGCG	1472	CGCGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGCGGG	3669
197	GCUGCCCA G GCUGGCCG	1473	CGGCCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGCAGC	3670
201	CCCAGGCU G GCCGCCGC	1474	GCGGCGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCUGGG	3671
224	GAUGUAGC G GGCUCCGG	1475	CCGGAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCUACAUC	3672
225	AUGUAGCG G GCUCCGGA	1476	UCCGGAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCUACAU	3673
231	CGGGCUCC G GAUCCCAG	1477	CUGGGAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAGCCCG	3674
232	GGGCUCCG G AUCCCAGC	1478	GCUGGGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGAGCCC	3675
265	UGCUCUGC G GAUCUCCC	1479	GGGAGAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGAGCA	3676
266	GCUCUGCG G AUCUCCCC	1480	GGGGAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCAGAGC	3677
294	CACAGCCC G GACCCGGG	1481	CCCGGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCUGUG	3678
295	ACAGCCCG G ACCCGGGG	1482	CCCCGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGGCUGU	3679
300	CCGGACCC G GGGGCUGG	1483	CCAGCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGUCCGG	3680
301	CGGACCCG G GGGCUGGC	1484	GCCAGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGGUCCG	3681
302	GGACCCGG G GGCUGGCC	1485	GGCCAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGGUCC	3682
303	GACCCGGG G GCUGGCCC	1486	GGGCCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGGGUC	3683
307	CGGGGGCU G GCCCAGGG	1487	CCCUGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCCCCG	3684
313	CUGGCCCA G GGCCCUGC	1488	GCAGGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGCCAG	3685
314	UGGCCCAG G GCCCUGCA	1489	UGCAGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGGCCA	3686
323	GCCCUGCA G GCCCUGGC	1490	GCCAGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAGGGC	3687
329	CAGGCCCU G GCGUCCUG	1491	CAGGACGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGCCUG	3688
362	UCUCCUGA G AAGCCACC	1492	GGUGGCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAGGAGA	3689
382	ACCACCCA G ACUUGGGG	1493	CCCCAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGUGGU	3690
387	CCAGACUU G GGGGCAGG	1494	CCUGCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGUCUGG	3691
388	CAGACUUG G GGGCAGGC	1495	GCCUGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGUCUG	3692
389	AGACUUGG G GGCAGGCG	1496	CGCCUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAGUCU	3693
390	GACUUGGG G GCAGGCGC	1497	GCGCCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAAGUC	3694
394	UGGGGGCA G GCGCCAGG	1498	CCUGGCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCCCCA	3695
401	AGGCGCCA G GGACGGAC	1499	GUCCGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCGCCU	3696
402	GGCGCCAG G GACGGACG	1500	CGUCCGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGCGCC	3697

Table 23

403	GCGCCAGG G ACGGACGU	1501	ACGUCCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGGCGC	3698
406	CCAGGGAC G GACGUGGG	1502	CCCACGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCCCUGG	3699
407	CAGGGACG G ACGUGGGC	1503	GCCCACGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUCCCUG	3700
412	ACGGACGU G GGCCAGUG	1504	CACUGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGUCCGU	3701
413	CGGACGUG G GCCAGUGC	1505	GCACUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACGUCCG	3702
429	CGAGCCCA G AGGGCCCG	1506	CGGGCCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGCUCG	3703
431	AGCCCAGA G GGCCCGAA	1507	UUCGGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUGGGCU	3704
432	GCCCAGAG G GCCCGAAG	1508	CUUCGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCUGGGC	3705
440	GGCCCGAA G GCCGGGGC	1509	GCCCCGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCGGGCC	3706
444	CGAAGGCC G GGGCCCAC	1510	GUGGGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCCUUCG	3707
445	GAAGGCCG G GGCCCACC	1511	GGUGGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGCCUUC	3708
446	AAGGCCGG G GCCCACCA	1512	UGGUGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGCCUU	3709
456	CCCACCAU G GCCCAAGC	1513	GCUUGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGUGGG	3710
473	CCUGCCCU G GCUCCUGC	1514	GCAGGAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGCAGG	3711
485	CCUGCUGU G GAUGGGCG	1515	CGCCCAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGCAGG	3712
486	CUGCUGUG G AUGGGCGC	1516	GCGCCCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAGCAG	3713
489	CUGUGGAU G GGCGCGGG	1517	CCCGCGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCCACAG	3714
490	UGUGGAUG G GCGCGGGA	1518	UCCCGCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUCCACA	3715
495	AUGGGCGC G GGAGUGCU	1519	AGCACUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGCCCAU	3716
496	UGGGCGCG G GAGUGCUG	1520	CAGCACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCGCCCA	3717
497	GGGCGCGG G AGUGCUGC	1521	GCAGCACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCGCCC	3718
514	CUGCCCAC G GCACCCAG	1522	CUGGGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGGGCAG	3719
526	CCCAGCAC G GCAUCCGG	1523	CCGGAUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGCUGGG	3720
533	CGGCAUCC G GCUGCCCC	1524	GGGGCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAUGCCG	3721
550	UGCGCAGC G GCCUGGGG	1525	CCCCAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCUGCGCA	3722
555	AGCGGCCU G GGGGGCGC	1526	GCGCCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGCCGCU	3723
556	GCGGCCUG G GGGGCGCC	1527	GGCGCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGCCGC	3724
557	CGGCCUGG G GGGCGCCC	1528	GGGCGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGGCCG	3725
558	GGCCUGGG G GGCGCCCC	1529	GGGGCGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAGGCC	3726
559	GCCUGGGG G GCGCCCCC	1530	GGGGGCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCAGGC	3727
570	GCCCCCCU G GGGCUGCG	1531	CGCAGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGGGC	3728
571	CCCCCCUG G GGCUGCGG	1532	CCGCAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGGGGG	3729
572	CCCCCUGG G GCUGCGGC	1533	GCCGCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGGGGG	3730
578	GGGGCUGC G GCUGCCCC	1534	GGGGCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGCCCC	3731

Table 23

587	GCUGCCCC G GGAGACCG	1535	CGGUCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGGCAGC	3732
588	CUGCCCCG G GAGACCGA	1536	UCGGUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGGGCAG	3733
589	UGCCCCGG G AGACCGAC	1537	GUCGGUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGGGCA	3734
591	CCCCGGGA G ACCGACGA	1538	UCGUCGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCGGGG	3735
601	CCGACGAA G AGCCCGAG	1539	CUCGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCGUCGG	3736
609	GAGCCCGA G GAGCCCGG	1540	CCGGGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCGGGCUC	3737
610	AGCCCGAG G AGCCCGGC	1541	GCCGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCGGGCU	3738
616	AGGAGCCC G GCCGGAGG	1542	CCUCCGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCUCCU	3739
620	GCCCGGCC G GAGGGGCA	1543	UGCCCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCCGGGC	3740
621	CCCGGCCG G AGGGGCAG	1544	CUGCCCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGCCGGG	3741
623	CGGCCGGA G GGGCAGCU	1545	AGCUGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCGGCCG	3742
624	GGCCGGAG G GGCAGCUU	1546	AAGCUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCGGCC	3743
625	GCCGGAGG G GCAGCUUU	1547	AAAGCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUCCGGC	3744
636	AGCUUUGU G GAGAUGGU	1548	ACCAUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAAGCU	3745
637	GCUUUGUG G AGAUGGUG	1549	CACCAUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAAAGC	3746
639	UUUGUGGA G AUGGUGGA	1550	UCCACCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCACAAA	3747
642	GUGGAGAU G GUGGACAA	1551	UUGUCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUCCAC	3748
645	GAGAUGGU G GACAACCU	1552	AGGUUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAUCUC	3749
646	AGAUGGUG G ACAACCUG	1553	CAGGUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCAUCU	3750
656	CAACCUGA G GGCAAGU	1554	ACUUGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAGGUUG	3751
657	AACCUGAG G GGCAAGUC	1555	GACUUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCAGGUU	3752
658	ACCUGAGG G GCAAGUCG	1556	CGACUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUCAGGU	3753
666	GGCAAGUC G GGGCAGGG	1557	CCCUGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GACUUGCC	3754
667	GCAAGUCG G GGCAGGGC	1558	GCCCUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGACUUGC	3755
668	CAAGUCGG G GCAGGGCU	1559	AGCCCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGACUUG	3756
672	UCGGGGCA G GGCUACUA	1560	UAGUAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCCCGA	3757
673	CGGGGCAG G GCUACUAC	1561	GUAGUAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCCCCG	3758
684	UACUACGU G GAGAUGAC	1562	GUCAUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGUAGUA	3759
685	ACUACGUG G AGAUGACC	1563	GGUCAUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACGUAGU	3760
687	UACGUGGA G AUGACCGU	1564	ACGGUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCACGUA	3761
696	AUGACCGU G GGCAGCCC	1565	GGGCUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGGUCAU	3762
697	UGACCGUG G GCAGCCCC	1566	GGGGCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACGGUCA	3763
711	CCCCCGCA G ACGCUCAA	1567	UUGAGCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGGGGG	3764
726	AACAUCCU G GUGGAUAC	1568	GUAUCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAUGUU	3765

Table 23

729	AUCCUGGU G GAUACAGG	1569	CCUGUAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAGGAU	3766
730	UCCUGGUG G AUACAGGC	1570	GCCUGUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCAGGA	3767
736	UGGAUACA G GCAGCAGU	1571	ACUGCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUAUCCA	3768
756	UUUGCAGU G GGUGCUGC	1572	GCAGCACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGCAAA	3769
757	UUGCAGUG G GUGCUGCC	1573	GGCAGCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUGCAA	3770
795	UACUACCA G AGGCAGCU	1574	AGCUGCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGUAGUA	3771
797	CUACCAGA G GCAGCUGU	1575	ACAGCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUGGUAG	3772
818	CACAUACC G GGACCUCC	1576	GGAGGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUAUGUG	3773
819	ACAUACCG G GACCUCCG	1577	CGGAGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGUAUGU	3774
820	CAUACCGG G ACCUCCGG	1578	CCGGAGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGUAUG	3775
827	GGACCUCC G GAAGGGUG	1579	CACCCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAGGUCC	3776
828	GACCUCCG G AAGGGUGU	1580	ACACCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGAGGUC	3777
831	CUCCGGAA G GGUGUGUA	1581	UACACACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCGGAG	3778
832	UCCGGAAG G GUGUGUAU	1582	AUACACAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCCGGA	3779
855	UACACCCA G GGCAAGUG	1583	CACUUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGUGUA	3780
856	ACACCCAG G GCAAGUGG	1584	CCACUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGGUGU	3781
863	GGGCAAGU G GGAAGGGG	1585	CCCCUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUUGCCC	3782
864	GGCAAGUG G GAAGGGGA	1586	UCCCCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUUGCC	3783
865	GCAAGUGG G AAGGGGAG	1587	CUCCCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACUUGC	3784
868	AGUGGGAA G GGGAGCUG	1588	CAGCUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCCACU	3785
869	GUGGGAAG G GGAGCUGG	1589	CCAGCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCCCAC	3786
870	UGGGAAGG G GAGCUGGG	1590	CCCAGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUUCCCA	3787
871	GGGAAGGG G AGCUGGGC	1591	GCCCAGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCUUCCC	3788
876	GGGGAGCU G GGCACCGA	1592	UCGGUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUCCCC	3789
877	GGGAGCUG G GCACCGAC	1593	GUCGGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCUCCC	3790
888	ACCGACCU G GUAAGCAU	1594	AUGCUUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUCGGU	3791
904	UCCCCCAU G GCCCCAAC	1595	GUUGGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGGGGA	3792
952	CUGAAUCA G ACAAGUUC	1596	GAACUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAUUCAG	3793
970	UCAUCAAC G GCUCCAAC	1597	GUUGGAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUGAUGA	3794
980	CUCCAACU G GGAAGGCA	1598	UGCCUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUGGAG	3795
981	UCCAACUG G GAAGGCAU	1599	AUGCCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGUUGGA	3796
982	CCAACUGG G AAGGCAUC	1600	GAUGCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGUUGG	3797
985	ACUGGGAA G GCAUCCUG	1601	CAGGAUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCCAGU	3798
993	GGCAUCCU G GGCUGGC	1602	GCCAGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAUGCC	3799

Table 23

994	GCAUCCUG G GGCUGGCC	1603	GGCCAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGAUGC	3800
995	CAUCCUGG G GCUGGCCU	1604	AGGCCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGGAUG	3801
999	CUGGGGCU G GCCUAUGC	1605	GCAUAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCCCAG	3802
1011	UAUGCUGA G AUUGCCAG	1606	CUGGCAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAGCAUA	3803
1019	GAUUGCCA G GCCUGACG	1607	CGUCAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCAAUC	3804
1035	GACUCCCU G GAGCCUUU	1608	AAAGGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGAGUC	3805
1036	ACUCCCUG G AGCCUUUC	1609	GAAAGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGGAGU	3806
1056	GACUCUCU G GUAAAGCA	1610	UGCUUUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGAGUC	3807
1065	GUAAAGCA G ACCCACGU	1611	ACGUGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUUUAC	3808
1102	AGCUUUGU G GUGCUGGC	1612	GCCAGCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAAGCU	3809
1108	GUGGUGCU G GCUUCCCC	1613	GGGGAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCACCAC	3810
1137	GAAGUGCU G GCCUCUGU	1614	ACAGAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCACUUC	3811
1147	CCUCUGUC G GAGGGAGC	1615	GCUCCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GACAGAGG	3812
1148	CUCUGUCG G AGGGAGCA	1616	UGCUCCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGACAGAG	3813
1150	CUGUCGGA G GGAGCAUG	1617	CAUGCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCGACAG	3814
1151	UGUCGGAG G GAGCAUGA	1618	UCAUGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCGACA	3815
1152	GUCGGAGG G AGCAUGAU	1619	AUCAUGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUCCGAC	3816
1165	UGAUCAUU G GAGGUAUC	1620	GAUACCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGAUCA	3817
1166	GAUCAUUG G AGGUAUCG	1621	CGAUACCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAUGAUC	3818
1168	UCAUUGGA G GUAUCGAC	1622	GUCGAUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAAUGA	3819
1192	UGUACACA G GCAGUCUC	1623	GAGACUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGUACA	3820
1202	CAGUCUCU G GUAUACAC	1624	GUGUAUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGACUG	3821
1217	ACCCAUCC G GCGGGAGU	1625	ACUCCCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAUGGGU	3822
1220	CAUCCGGC G GGAGUGGU	1626	ACCACUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCGGAUG	3823
1221	AUCCGGCG G GAGUGGUA	1627	UACCACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCCGGAU	3824
1222	UCCGGCGG G AGUGGUAU	1628	AUACCACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCCGGA	3825
1226	GCGGGAGU G GUAUUAUG	1629	CAUAAUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUCCCGC	3826
1236	UAUUAUGA G GUGAUCAU	1630	AUGAUCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAUAAUA	3827
1250	CAUUGUGC G GGUGGAGA	1631	UCUCCACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCACAAUG	3828
1251	AUUGUGCG G GUGGAGAU	1632	AUCUCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCACAAU	3829
1254	GUGCGGGU G GAGAUCAA	1633	UUGAUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCGCAC	3830
1255	UGCGGGUG G AGAUCAAU	1634	AUUGAUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCCGCA	3831
1257	CGGGUGGA G AUCAAUGG	1635	CCAUUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCACCCG	3832
1264	AGAUCAAU G GACAGGAU	1636	AUCCUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUGAUCU	3833

Table 23

1265	GAUCAAUG G ACAGGAUC	1637	GAUCCUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUUGAUC	3834
1269	AAUGGACA G GAUCUGAA	1638	UUCAGAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCCAUU	3835
1270	AUGGACAG G AUCUGAAA	1639	UUUCAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUCCAU	3836
1281	CUGAAAAU G GACUGCAA	1640	UUGCAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUUCAG	3837
1282	UGAAAAUG G ACUGCAAG	1641	CUUGCAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUUUUCA	3838
1290	GACUGCAA G GAGUACAA	1642	UUGUACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGCAGUC	3839
1291	ACUGCAAG G AGUACAAC	1643	GUUGUACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGCAGU	3840
1308	UAUGACAA G AGCAUUGU	1644	ACAAUGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUCAUA	3841
1317	AGCAUUGU G GACAGUGG	1645	CCACUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAUGCU	3842
1318	GCAUUGUG G ACAGUGGC	1646	GCCACUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAAUGC	3843
1324	UGGACAGU G GCACCACC	1647	GGUGGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGUCCA	3844
1350	UUGCCCAA G AAAGUGUU	1648	AACACUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGGCAA	3845
1383	UCCAUCAA G GCAGCCUC	1649	GAGGCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGAUGGA	3846
1398	UCCUCCAC G GAGAAGUU	1650	AACUUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGGAGGA	3847
1399	CCUCCACG G AGAAGUUC	1651	GAACUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUGGAGG	3848
1401	UCCACGGA G AAGUUCCC	1652	GGGAACUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCGUGGA	3849
1414	UCCCUGAU G GUUUCUGG	1653	CCAGAAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAGGGA	3850
1421	UGGUUUCU G GCUAGGAG	1654	CUCCUAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAACCA	3851
1426	UCUGGCUA G GAGAGCAG	1655	CUGCUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGCCAGA	3852
1427	CUGGCUAG G AGAGCAGC	1656	GCUGCUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAGCCAG	3853
1429	GGCUAGGA G AGCAGCUG	1657	CAGCUGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUAGCC	3854
1437	GAGCAGCU G GUGUGCUG	1658	CAGCACAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUGCUC	3855
1445	GGUGUGCU G GCAAGCAG	1659	CUGCUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCACACC	3856
1453	GGCAAGCA G GCACCACC	1660	GGUGGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUUGCC	3857
1466	CACCCCUU G GAACAUUU	1661	AAAUGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGGGUG	3858
1467	ACCCCUUG G AACAUUUU	1662	AAAAUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGGGGU	3859
1500	UACCUAAU G GGUGAGGU	1663	ACCUCACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUAGGUA	3860
1501	ACCUAAUG G GUGAGGUU	1664	AACCUCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUUAGGU	3861
1506	AUGGGUGA G GUUACCAA	1665	UUGGUAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCACCCAU	3862
1556	AUACCUGC G GCCAGUGG	1666	CCACUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGGUAU	3863
1563	CGGCCAGU G GAAGAUGU	1667	ACAUCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGGCCG	3864
1564	GGCCAGUG G AAGAUGUG	1668	CACAUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUGGCC	3865
1567	CAGUGGAA G AUGUGGCC	1669	GGCCACAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCACUG	3866
1572	GAAGAUGU G GCCACGUC	1670	GACGUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUCUUC	3867

Table 23

1585	CGUCCCAA G ACGACUGU	1671	ACAGUCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGGACG	3868
1623	UCAUCCAC G GGCACUGU	1672	ACAGUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGGAUGA	3869
1624	CAUCCACG G GCACUGUU	1673	AACAGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUGGAUG	3870
1635	ACUGUUAU G GGAGCUGU	1674	ACAGCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAACAGU	3871
1636	CUGUUAUG G GAGCUGUU	1675	AACAGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUAACAG	3872
1637	UGUUAUGG G AGCUGUUA	1676	UAACAGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUAACA	3873
1650	GUUAUCAU G GAGGGCUU	1677	AAGCCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAUAAC	3874
1651	UUAUCAUG G AGGGCUUC	1678	GAAGCCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGAUAA	3875
1653	AUCAUGGA G GGCUUCUA	1679	UAGAAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAUGAU	3876
1654	UCAUGGAG G GCUUCUAC	1680	GUAGAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCAUGA	3877
1676	CUUUGAUC G GGCCCGAA	1681	UUCGGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUCAAAG	3878
1677	UUUGAUCG G GCCCGAAA	1682	UUUCGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGAUCAAA	3879
1693	AACGAAUU G GCUUUGCU	1683	AGCAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUUCGUU	3880
1733	UGAGUUCA G GACGGCAG	1684	CUGCCGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAACUCA	3881
1734	GAGUUCAG G ACGGCAGC	1685	GCUGCCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGAACUC	3882
1737	UUCAGGAC G GCAGCGGU	1686	ACCGCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCCUGAA	3883
1743	ACGGCAGC G GUGGAAGG	1687	CCUUCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCUGCCGU	3884
1746	GCAGCGGU G GAAGGCCC	1688	GGGCCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCGCUGC	3885
1747	CAGCGGUG G AAGGCCCU	1689	AGGGCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCGCUG	3886
1750	CGGUGGAA G GCCCUUUU	1690	AAAAGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCACCG	3887
1767	GUCACCUU G GACAUGGA	1691	UCCAUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGUGAC	3888
1768	UCACCUUG G ACAUGGAA	1692	UUCCAUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGGUGA	3889
1773	UUGGACAU G GAAGACUG	1693	CAGUCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGUCCAA	3890
1774	UGGACAUG G AAGACUGU	1694	ACAGUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGUCCA	3891
1777	ACAUGGAA G ACUGUGGC	1695	GCCACAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCAUGU	3892
1783	AAGACUGU G GCUACAAC	1696	GUUGUAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGUCUU	3893
1800	AUUCCACA G ACAGAUGA	1697	UCAUCUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGGAAU	3894
1804	CACAGACA G AUGAGUCA	1698	UGACUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCUGUG	3895
1839	UAUGUCAU G GCUGCCAU	1699	AUGGCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGACAUA	3896
1881	UGCCUCAU G GUGUGUCA	1700	UGACACAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAGGCA	3897
1892	GUGUCAGU G GCGCUGCC	1701	GGCAGCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGACAC	3898
1960	UGAAGUGA G GAGGCCCA	1702	UGGGCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCACUUCA	3899
1961	GAAGUGAG G AGGCCCAU	1703	AUGGGCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCACUUC	3900
1963	AGUGAGGA G GCCCAUGG	1704	CCAUGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUCACU	3901

Table 23

1970	AGGCCCAU G GGCAGAAG	1705	CUUCUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGGCCU	3902
1971	GGCCCAUG G GCAGAAGA	1706	UCUUCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGGGCC	3903
1975	CAUGGGCA G AAGAUAGA	1707	UCUAUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCCAUG	3904
1978	GGGCAGAA G AUAGAGAU	1708	AUCUCUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUGCCC	3905
1982	AGAAGAUA G AGAUUCCC	1709	GGGAAUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAUCUUCU	3906
1984	AAGAUAGA G AUUCCCCU	1710	AGGGGAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUAUCUU	3907
1993	AUUCCCCU G GACCACAC	1711	GUGUGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGAAU	3908
1994	UUCCCCUG G ACCACACC	1712	GGUGUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGGGAA	3909
2008	ACCUCCGU G GUUCACUU	1713	AAGUGAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGGAGGU	3910
2018	UUCACUUU G GUCACAAG	1714	CUUGUGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGUGAA	3911
2029	CACAAGUA G GAGACACA	1715	UGUGUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACUUGUG	3912
2030	ACAAGUAG G AGACACAG	1716	CUGUGUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUACUUGU	3913
2032	AAGUAGGA G ACACAGAU	1717	AUCUGUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUACUU	3914
2038	GAGACACA G AUGGCACC	1718	GGUGCCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGUCUC	3915
2041	ACACAGAU G GCACCUGU	1719	ACAGGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUGUGU	3916
2050	GCACCUGU G GCCAGAGC	1720	GCUCUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGGUGC	3917
2055	UGUGGCCA G AGCACCUC	1721	GAGGUGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCCACA	3918
2065	GCACCUCA G GACCCUCC	1722	GGAGGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGGUGC	3919
2066	CACCUCAG G ACCCUCCC	1723	GGGAGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGAGGUG	3920
2101	GCCUUGAU G GAGAAGGA	1724	UCCUUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAAGGC	3921
2102	CCUUGAUG G AGAAGGAA	1725	UUCCUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUCAAGG	3922
2104	UUGAUGGA G AAGGAAAA	1726	UUUUCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAUCAA	3923
2107	AUGGAGAA G GAAAAGGC	1727	GCCUUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUCCAU	3924
2108	UGGAGAAG G AAAAGGCU	1728	AGCCUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCUCCA	3925
2113	AAGGAAAA G GCUGGCAA	1729	UUGCCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUCCUU	3926
2117	AAAAGGCU G GCAAGGUG	1730	CACCUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCUUUU	3927
2122	GCUGGCAA G GUGGGUUC	1731	GAACCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGCCAGC	3928
2125	GGCAAGGU G GGUUCCAG	1732	CUGGAACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCUUGCC	3929
2126	GCAAGGUG G GUUCCAGG	1733	CCUGGAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCUUGC	3930
2133	GGGUUCCA G GGACUGUA	1734	UACAGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAACCC	3931
2134	GGUUCCAG G GACUGUAC	1735	GUACAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGAACC	3932
2135	GUUCCAGG G ACUGUACC	1736	GGUACAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGGAAC	3933
2148	UACCUGUA G GAAACAGA	1737	UCUGUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACAGGUA	3934
2149	ACCUGUAG G AAACAGAA	1738	UUCUGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUACAGGU	3935

Table 23

2155	AGGAAACA G AAAAGAGA	1739	UCUCUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUUCCU	3936
2160	ACAGAAAA G AGAAGAAA	1740	UUUCUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUCUGU	3937
2162	AGAAAAGA G AAGAAAGA	1741	UCUUUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUUUCU	3938
2165	AAAGAGAA G AAAGAAGC	1742	GCUUCUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUCUUU	3939
2169	AGAAGAAA G AAGCACUC	1743	GAGUGCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUCUUCU	3940
2182	ACUCUGCU G GCGGGAAU	1744	AUUCCCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGAGU	3941
2185	CUGCUGGC G GGAAUACU	1745	AGUAUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCAGCAG	3942
2186	UGCUGGCG G GAAUACUC	1746	GAGUAUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCCAGCA	3943
2187	GCUGGCGG G AAUACUCU	1747	AGAGUAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCCAGC	3944
2197	AUACUCUU G GUCACCUC	1748	GAGGUGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAGUAU	3945
2217	UUUAAGUC G GGAAAUUC	1749	GAAUUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GACUUAAA	3946
2218	UUAAGUCG G GAAAUUCU	1750	AGAAUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGACUUAA	3947
2219	UAAGUCGG G AAAUUCUG	1751	CAGAAUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGACUUA	3948
2311	UAGUUUCA G AAGUACUG	1752	CAGUACUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAAACUA	3949
2319	GAAGUACU G GCAUCACA	1753	UGUGAUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUACUUC	3950
2332	CACACGCA G GUUACCUU	1754	AAGGUAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGUGUG	3951
2341	GUUACCUU G GCGUGUGU	1755	ACACACGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGUAAC	3952
2356	GUCCCUGU G GUACCCUG	1756	CAGGGUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGGGAC	3953
2364	GGUACCCU G GCAGAGAA	1757	UUCUCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGUACC	3954
2368	CCCUGGCA G AGAAGAGA	1758	UCUCUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCAGGG	3955
2370	CUGGCAGA G AAGAGACC	1759	GGUCUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUGCCAG	3956
2373	GCAGAGAA G AGACCAAG	1760	CUUGGUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUCUGC	3957
2375	AGAGAAGA G ACCAAGCU	1761	AGCUUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUCUCU	3958
2396	UCCCUGCU G GCCAAAGU	1762	ACUUUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGGGA	3959
2410	AGUCAGUA G GAGAGGAU	1763	AUCCUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACUGACU	3960
2411	GUCAGUAG G AGAGGAUG	1764	CAUCCUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUACUGAC	3961
2413	CAGUAGGA G AGGAUGCA	1765	UGCAUCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUACUG	3962
2415	GUAGGAGA G GAUGCACA	1766	UGUGCAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUCCUAC	3963
2416	UAGGAGAG G AUGCACAG	1767	CUGUGCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCUCCUA	3964
2441	UUGCUUUA G AGACAGGG	1768	CCCUGUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAAGCAA	3965
2443	GCUUUAGA G ACAGGGAC	1769	GUCCCUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUAAAGC	3966
2447	UAGAGACA G GGACUGUA	1770	UACAGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCUCUA	3967
2448	AGAGACAG G GACUGUAU	1771	AUACAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUCUCU	3968
2449	GAGACAGG G ACUGUAUA	1772	UAUACAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGUCUC	3969

Table 23

2473	CUAACAUU G GUGCAAAG	1773	CUUUGCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGUUAG	3970
2481	GGUGCAAA G AUUGCCUC	1774	GAGGCAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUGCACC	3971
2511	AAAAACUA G AAAAAAAA	1775	UUUUUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGUUUUU	3972

Input Sequence = AF190725. Cut Site = G/.
Stem Length = 8. Core Sequence = GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG
AF190725 (Homo sapiens beta-site APP cleaving enzyme (BACE) mRNA; 2526 bp)

Table 24

Table 24: Human Phospholamban (PLN) Hammerhead Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
16	AGAAAACU C CCCAGCUA	1	UAGCUGGG CUGAUGAG X CGAA AGUUUUCU	1137
24	CCCCAGCU A AACACCCG	2	CGGGUGUU CUGAUGAG X CGAA AGCUGGGG	1138
34	ACACCCGU A AGACUUCA	3	UGAAGUCU CUGAUGAG X CGAA ACGGGUGU	1139
40	GUAAGACU U CAUACAAC	4	GUUGUAUG CUGAUGAG X CGAA AGUCUUAC	1140
41	UAAGACUU C AUACAACA	5	UGUUGUAU CUGAUGAG X CGAA AAGUCUUA	1141
44	GACUUCAU A CAACACAA	6	UUGUGUUG CUGAUGAG X CGAA AUGAAGUC	1142
54	AACACAAU A CUCUAUAC	7	GUAUAGAG CUGAUGAG X CGAA AUUGUGUU	1143
57	ACAAUACU C UAUACUGU	8	ACAGUAUA CUGAUGAG X CGAA AGUAUUGU	1144
59	AAUACUCU A UACUGUGA	9	UCACAGUA CUGAUGAG X CGAA AGAGUAUU	1145
61	UACUCUAU A CUGUGAUG	10	CAUCACAG CUGAUGAG X CGAA AUAGAGUA	1146
72	GUGAUGAU C ACAGCUGC	11	GCAGCUGU CUGAUGAG X CGAA AUCAUCAC	1147
88	CCAAGGCU A CCUAAAAG	12	CUUUUAGG CUGAUGAG X CGAA AGCCUUGG	1148
92	GGCUACCU A AAAGAAGA	13	UCUUCUUU CUGAUGAG X CGAA AGGUAGCC	1149
105	AAGACAGU U AUCUCAUA	14	UAUGAGAU CUGAUGAG X CGAA ACUGUCUU	1150
106	AGACAGUU A UCUCAUAU	15	AUAUGAGA CUGAUGAG X CGAA AACUGUCU	1151
108	ACAGUUAU C UCAUAUUU	16	AAAUAUGA CUGAUGAG X CGAA AUAACUGU	1152
110	AGUUAUCU C AUAUUUGG	17	CCAAAUAU CUGAUGAG X CGAA AGAUAACU	1153
113	UAUCUCAU A UUUGGCUG	18	CAGCCAAA CUGAUGAG X CGAA AUGAGAUA	1154
115	UCUCAUAU U UGGCUGCC	19	GGCAGCCA CUGAUGAG X CGAA AUAUGAGA	1155
116	CUCAUAUU U GGCUGCCA	20	UGGCAGCC CUGAUGAG X CGAA AAUAUGAG	1156
128	UGCCAGCU U UUUAUCUU	21	AAGAUAAA CUGAUGAG X CGAA AGCUGGCA	1157
129	GCCAGCUU U UUAUCUUU	22	AAAGAUAA CUGAUGAG X CGAA AAGCUGGC	1158
130	CCAGCUUU U UAUCUUUC	23	GAAAGAUA CUGAUGAG X CGAA AAAGCUGG	1159
131	CAGCUUUU U AUCUUUCU	24	AGAAAGAU CUGAUGAG X CGAA AAAAGCUG	1160
132	AGCUUUUU A UCUUUCUC	25	GAGAAAGA CUGAUGAG X CGAA AAAAAGCU	1161
134	CUUUUUAU C UUUCUCUC	26	GAGAGAAA CUGAUGAG X CGAA AUAAAAAG	1162
136	UUUUAUCU U UCUCUCGA	27	UCGAGAGA CUGAUGAG X CGAA AGAUAAAA	1163
137	UUUAUCUU U CUCUCGAC	28	GUCGAGAG CUGAUGAG X CGAA AAGAUAAA	1164
138	UUAUCUUU C UCUCGACC	29	GGUCGAGA CUGAUGAG X CGAA AAAGAUAA	1165
140	AUCUUUCU C UCGACCAC	30	GUGGUCGA CUGAUGAG X CGAA AGAAAGAU	1166
142	CUUUCUCU C GACCACUU	31	AAGUGGUC CUGAUGAG X CGAA AGAGAAAG	1167
150	CGACCACU U AAAACUUC	32	GAAGUUUU CUGAUGAG X CGAA AGUGGUCG	1168
151	GACCACUU A AAACUUCA	33	UGAAGUUU CUGAUGAG X CGAA AAGUGGUC	1169
157	UUAAAACU U CAGACUUC	34	GAAGUCUG CUGAUGAG X CGAA AGUUUUAA	1170
158	UAAAACUU C AGACUUCC	35	GGAAGUCU CUGAUGAG X CGAA AAGUUUUA	1171
164	UUCAGACU U CCUGUCCU	36	AGGACAGG CUGAUGAG X CGAA AGUCUGAA	1172
165	UCAGACUU C CUGUCCUG	37	CAGGACAG CUGAUGAG X CGAA AAGUCUGA	1173
170	CUUCCUGU C CUGCUGGU	38	ACCAGCAG CUGAUGAG X CGAA ACAGGAAG	1174
179	CUGCUGGU A UCAUGGAG	39	CUCCAUGA CUGAUGAG X CGAA ACCAGCAG	1175
181	GCUGGUAU C AUGGAGAA	40	UUCUCCAU CUGAUGAG X CGAA AUACCAGC	1176
193	GAGAAAGU C CAAUACCU	41	AGGUAUUG CUGAUGAG X CGAA ACUUUCUC	1177
198	AGUCCAAU A CCUCACUC	42	GAGUGAGG CUGAUGAG X CGAA AUUGGACU	1178

Table 24

202	CAAUACCU C ACUCGCUC	43	GAGCGAGU CUGAUGAG X CGAA AGGUAUUG	1179
206	ACCUCACU C GCUCAGCU	44	AGCUGAGC CUGAUGAG X CGAA AGUGAGGU	1180
210	CACUCGCU C AGCUAUAA	45	UUAUAGCU CUGAUGAG X CGAA AGCGAGUG	1181
215	GCUCAGCU A UAAGAAGA	46	UCUUCUUA CUGAUGAG X CGAA AGCUGAGC	1182
217	UCAGCUAU A AGAAGAGC	47	GCUCUUCU CUGAUGAG X CGAA AUAGCUGA	1183
228	AAGAGCCU C AACCAUUG	48	CAAUGGUU CUGAUGAG X CGAA AGGCUCUU	1184
235	UCAACCAU U GAAAUGCC	49	GGCAUUUC CUGAUGAG X CGAA AUGGUUGA	1185
245	AAAUGCCU C AACAAGCA	50	UGCUUGUU CUGAUGAG X CGAA AGGCAUUU	1186
257	AAGCACGU C AAAAGCUA	51	UAGCUUUU CUGAUGAG X CGAA ACGUGCUU	1187
265	CAAAAGCU A CAGAAUCU	52	AGAUUCUG CUGAUGAG X CGAA AGCUUUUG	1188
272	UACAGAAU C UAUUUAUC	53	GAUAAAUA CUGAUGAG X CGAA AUUCUGUA	1189
274	CAGAAUCU A UUUAUCAA	54	UUGAUAAA CUGAUGAG X CGAA AGAUUCUG	1190
276	GAAUCUAU U UAUCAAUU	55	AAUUGAUA CUGAUGAG X CGAA AUAGAUUC	1191
277	AAUCUAUU U AUCAAUUU	56	AAAUUGAU CUGAUGAG X CGAA AAUAGAUU	1192
278	AUCUAUUU A UCAAUUUC	57	GAAAUUGA CUGAUGAG X CGAA AAAUAGAU	1193
280	CUAUUUAU C AAUUUCUG	58	CAGAAAUU CUGAUGAG X CGAA AUAAAUAG	1194
284	UUAUCAAU U UCUGUCUC	59	GAGACAGA CUGAUGAG X CGAA AUUGAUAA	1195
285	UAUCAAUU U CUGUCUCA	60	UGAGACAG CUGAUGAG X CGAA AAUUGAUA	1196
286	AUCAAUUU C UGUCUCAU	61	AUGAGACA CUGAUGAG X CGAA AAAUUGAU	1197
290	AUUUCUGU C UCAUCUUA	62	UAAGAUGA CUGAUGAG X CGAA ACAGAAAU	1198
292	UUCUGUCU C AUCUUAAU	63	AUUAAGAU CUGAUGAG X CGAA AGACAGAA	1199
295	UGUCUCAU C UUAAUAUG	64	CAUAUUAA CUGAUGAG X CGAA AUGAGACA	1200
297	UCUCAUCU U AAUAUGUC	65	GACAUAUU CUGAUGAG X CGAA AGAUGAGA	1201
298	CUCAUCUU A AUAUGUCU	66	AGACAUAU CUGAUGAG X CGAA AAGAUGAG	1202
301	AUCUUAAU A UGUCUCUU	67	AAGAGACA CUGAUGAG X CGAA AUUAAGAU	1203
305	UAAUAUGU C UCUUGCUG	68	CAGCAAGA CUGAUGAG X CGAA ACAUAUUA	1204
307	AUAUGUCU C UUGCUGAU	69	AUCAGCAA CUGAUGAG X CGAA AGACAUAU	1205
309	AUGUCUCU U GCUGAUCU	70	AGAUCAGC CUGAUGAG X CGAA AGAGACAU	1206
316	UUGCUGAU C UGUAUCAU	71	AUGAUACA CUGAUGAG X CGAA AUCAGCAA	1207
320	UGAUCUGU A UCAUCGUG	72	CACGAUGA CUGAUGAG X CGAA ACAGAUCA	1208
322	AUCUGUAU C AUCGUGAU	73	AUCACGAU CUGAUGAG X CGAA AUACAGAU	1209
325	UGUAUCAU C GUGAUGCU	74	AGCAUCAC CUGAUGAG X CGAA AUGAUACA	1210
334	GUGAUGCU U CUCUGAAG	75	CUUCAGAG CUGAUGAG X CGAA AGCAUCAC	1211
335	UGAUGCUU C UCUGAAGU	76	ACUUCAGA CUGAUGAG X CGAA AAGCAUCA	1212
337	AUGCUUCU C UGAAGUUC	77	GAACUUCA CUGAUGAG X CGAA AGAAGCAU	1213
344	UCUGAAGU U CUGCUACA	78	UGUAGCAG CUGAUGAG X CGAA ACUUCAGA	1214
345	CUGAAGUU C UGCUACAA	79	UUGUAGCA CUGAUGAG X CGAA AACUUCAG	1215
350	GUUCUGCU A CAACCUCU	80	AGAGGUUG CUGAUGAG X CGAA AGCAGAAC	1216
357	UACAACCU C UAGAUCUG	81	CAGAUCUA CUGAUGAG X CGAA AGGUUGUA	1217
359	CAACCUCU A GAUCUGCA	82	UGCAGAUC CUGAUGAG X CGAA AGAGGUUG	1218
363	CUCUAGAU C UGCAGCUU	83	AAGCUGCA CUGAUGAG X CGAA AUCUAGAG	1219
371	CUGCAGCU U GCCACAUC	84	GAUGUGGC CUGAUGAG X CGAA AGCUGCAG	1220
379	UGCCACAU C AGCUUAAA	85	UUUAAGCU CUGAUGAG X CGAA AUGUGGCA	1221
384	CAUCAGCU U AAAAUCUG	86	CAGAUUUU CUGAUGAG X CGAA AGCUGAUG	1222
385	AUCAGCUU A AAAUCUGU	87	ACAGAUUU CUGAUGAG X CGAA AAGCUGAU	1223
390	CUUAAAAU C UGUCAUCC	88	GGAUGACA CUGAUGAG X CGAA AUUUUAAG	1224
394	AAAUCUGU C AUCCCAUG	89	CAUGGGAU CUGAUGAG X CGAA ACAGAUUU	1225

Table 24

397	UCUGUCAU C CCAUGCAG	90	CUGCAUGG CUGAUGAG X CGAA AUGACAGA	1226
419	AAAACAAU A UUGUAUAA	91	UUAUACAA CUGAUGAG X CGAA AUUGUUUU	1227
421	AACAAUAU U GUAUAACA	92	UGUUAUAC CUGAUGAG X CGAA AUAUUGUU	1228
424	AAUAUUGU A UAACAGAC	93	GUCUGUUA CUGAUGAG X CGAA ACAAUAUU	1229
426	UAUUGUAU A ACAGACCA	94	UGGUCUGU CUGAUGAG X CGAA AUACAAUA	1230
437	AGACCACU U CCUGAGUA	95	UACUCAGG CUGAUGAG X CGAA AGUGGUCU	1231
438	GACCACUU C CUGAGUAG	96	CUACUCAG CUGAUGAG X CGAA AAGUGGUC	1232
445	UCCUGAGU A GAAGAGUU	97	AACUCUUC CUGAUGAG X CGAA ACUCAGGA	1233
453	AGAAGAGU U UCUUUGUG	98	CACAAAGA CUGAUGAG X CGAA ACUCUUCU	1234
454	GAAGAGUU U CUUUGUGA	99	UCACAAAG CUGAUGAG X CGAA AACUCUUC	1235
455	AAGAGUUU C UUUGUGAA	100	UUCACAAA CUGAUGAG X CGAA AAACUCUU	1236
457	GAGUUUCU U UGUGAAAA	101	UUUUCACA CUGAUGAG X CGAA AGAAACUC	1237
458	AGUUUCUU U GUGAAAAG	102	CUUUUCAC CUGAUGAG X CGAA AAGAAACU	1238
469	GAAAAGGU C AAGAUUAA	103	UUAAUCUU CUGAUGAG X CGAA ACCUUUUC	1239
475	GUCAAGAU U AAGACUAA	104	UUAGUCUU CUGAUGAG X CGAA AUCUUGAC	1240
476	UCAAGAUU A AGACUAAA	105	UUUAGUCU CUGAUGAG X CGAA AAUCUUGA	1241
482	UUAAGACU A AAACUUAU	106	AUAAGUUU CUGAUGAG X CGAA AGUCUUAA	1242
488	CUAAAACU U AUUGUUAC	107	GUAACAAU CUGAUGAG X CGAA AGUUUUAG	1243
489	UAAAACUU A UUGUUACC	108	GGUAACAA CUGAUGAG X CGAA AAGUUUUA	1244
491	AAACUUAU U GUUACCAU	109	AUGGUAAC CUGAUGAG X CGAA AUAAGUUU	1245
494	CUUAUUGU U ACCAUAUG	110	CAUAUGGU CUGAUGAG X CGAA ACAAUAAG	1246
495	UUAUUGUU A CCAUAUGU	111	ACAUAUGG CUGAUGAG X CGAA AACAAUAA	1247
500	GUUACCAU A UGUAUUCA	112	UGAAUACA CUGAUGAG X CGAA AUGGUAAC	1248
504	CCAUAUGU A UUCAUCUG	113	CAGAUGAA CUGAUGAG X CGAA ACAUAUGG	1249
506	AUAUGUAU U CAUCUGUU	114	AACAGAUG CUGAUGAG X CGAA AUACAUAU	1250
507	UAUGUAUU C AUCUGUUG	115	CAACAGAU CUGAUGAG X CGAA AAUACAUA	1251
510	GUAUUCAU C UGUUGGAU	116	AUCCAACA CUGAUGAG X CGAA AUGAAUAC	1252
514	UCAUCUGU U GGAUCUUG	117	CAAGAUCC CUGAUGAG X CGAA ACAGAUGA	1253
519	UGUUGGAU C UUGUAAAC	118	GUUUACAA CUGAUGAG X CGAA AUCCAACA	1254
521	UUGGAUCU U GUAAACAU	119	AUGUUUAC CUGAUGAG X CGAA AGAUCCAA	1255
524	GAUCUUGU A AACAUGAA	120	UUCAUGUU CUGAUGAG X CGAA ACAAGAUC	1256
540	AAAGGGCU U UAUUUUCA	121	UGAAAAUA CUGAUGAG X CGAA AGCCCUUU	1257
541	AAGGGCUU U AUUUUCAA	122	UUGAAAAU CUGAUGAG X CGAA AAGCCCUU	1258
542	AGGGCUUU A UUUUCAAA	123	UUUGAAAA CUGAUGAG X CGAA AAAGCCCU	1259
544	GGCUUUAU U UUCAAAAA	124	UUUUUGAA CUGAUGAG X CGAA AUAAAGCC	1260
545	GCUUUAUU U UCAAAAAU	125	AUUUUUGA CUGAUGAG X CGAA AAUAAAGC	1261
546	CUUUAUUU U CAAAAAUU	126	AAUUUUUG CUGAUGAG X CGAA AAAUAAAG	1262
547	UUUAUUUU C AAAAAUUA	127	UAAUUUUU CUGAUGAG X CGAA AAAAUAAA	1263
554	UCAAAAAU U AACUUCAA	128	UUGAAGUU CUGAUGAG X CGAA AUUUUUGA	1264
555	CAAAAAUU A ACUUCAAA	129	UUUGAAGU CUGAUGAG X CGAA AAUUUUUG	1265
559	AAUUAACU U CAAAAUAA	130	UUAUUUUG CUGAUGAG X CGAA AGUUAAUU	1266
560	AUUAACUU C AAAAUAAG	131	CUUAUUUU CUGAUGAG X CGAA AAGUUAAU	1267
566	UUCAAAAU A AGUGUAUA	132	UAUACACU CUGAUGAG X CGAA AUUUUGAA	1268
572	AUAAGUGU A UAAAAUGC	133	GCAUUUUA CUGAUGAG X CGAA ACACUUAU	1269
574	AAGUGUAU A AAAUGCAA	134	UUGCAUUU CUGAUGAG X CGAA AUACACUU	1270
587	GCAACUGU U GAUUUCCU	135	AGGAAAUC CUGAUGAG X CGAA ACAGUUGC	1271
591	CUGUUGAU U UCCUCAAC	136	GUUGAGGA CUGAUGAG X CGAA AUCAACAG	1272

Table 24

592	UGUUGAUU U CCUCAACA	137	UGUUGAGG CUGAUGAG X CGAA AAUCAACA	1273
593	GUUGAUUU C CUCAACAU	138	AUGUUGAG CUGAUGAG X CGAA AAAUCAAC	1274
596	GAUUUCCU C AACAUGGC	139	GCCAUGUU CUGAUGAG X CGAA AGGAAAUC	1275
606	ACAUGGCU C ACAAAUUU	140	AAAUUUGU CUGAUGAG X CGAA AGCCAUGU	1276
613	UCACAAAU U UCUAUCCC	141	GGGAUAGA CUGAUGAG X CGAA AUUUGUGA	1277
614	CACAAAUU U CUAUCCCA	142	UGGGAUAG CUGAUGAG X CGAA AAUUUGUG	1278
615	ACAAAUUU C UAUCCCAA	143	UUGGGAUA CUGAUGAG X CGAA AAAUUUGU	1279
617	AAAUUUCU A UCCCAAAU	144	AUUUGGGA CUGAUGAG X CGAA AGAAAUUU	1280
619	AUUUCUAU C CCAAAUCU	145	AGAUUUGG CUGAUGAG X CGAA AUAGAAAU	1281
626	UCCCAAAU C UUUUCUGA	146	UCAGAAAA CUGAUGAG X CGAA AUUUGGGA	1282
628	CCAAAUCU U UUCUGAAG	147	CUUCAGAA CUGAUGAG X CGAA AGAUUUGG	1283
629	CAAAUCUU U UCUGAAGA	148	UCUUCAGA CUGAUGAG X CGAA AAGAUUUG	1284
630	AAAUCUUU U CUGAAGAU	149	AUCUUCAG CUGAUGAG X CGAA AAAGAUUU	1285
631	AAUCUUUU C UGAAGAUG	150	CAUCUUCA CUGAUGAG X CGAA AAAAGAUU	1286
646	UGAAGAGU U UAGUUUUA	151	UAAAACUA CUGAUGAG X CGAA ACUCUUCA	1287
647	GAAGAGUU U AGUUUUAA	152	UUAAAACU CUGAUGAG X CGAA AACUCUUC	1288
648	AAGAGUUU A GUUUUAAA	153	UUUAAAAC CUGAUGAG X CGAA AAACUCUU	1289
651	AGUUUAGU U UUAAAACU	154	AGUUUUAA CUGAUGAG X CGAA ACUAAACU	1290
652	GUUUAGUU U UAAAACUG	155	CAGUUUUA CUGAUGAG X CGAA AACUAAAC	1291
653	UUUAGUUU U AAAACUGC	156	GCAGUUUU CUGAUGAG X CGAA AAACUAAA	1292
654	UUAGUUUU A AAACUGCA	157	UGCAGUUU CUGAUGAG X CGAA AAAACUAA	1293
675	CAACAAGU U CACUUCAU	158	AUGAAGUG CUGAUGAG X CGAA ACUUGUUG	1294
676	AACAAGUU C ACUUCAUA	159	UAUGAAGU CUGAUGAG X CGAA AACUUGUU	1295
680	AGUUCACU U CAUAUAUA	160	UAUAUAUG CUGAUGAG X CGAA AGUGAACU	1296
681	GUUCACUU C AUAUAUAA	161	UUAUAUAU CUGAUGAG X CGAA AAGUGAAC	1297
684	CACUUCAU A UAUAAAGC	162	GCUUUAUA CUGAUGAG X CGAA AUGAAGUG	1298
686	CUUCAUAU A UAAAGCAU	163	AUGCUUUA CUGAUGAG X CGAA AUAUGAAG	1299
688	UCAUAUAU A AAGCAUUA	164	UAAUGCUU CUGAUGAG X CGAA AUAUAUGA	1300
695	UAAAGCAU U AUUUUUAC	165	GUAAAAAU CUGAUGAG X CGAA AUGCUUUA	1301
696	AAAGCAUU A UUUUUACU	166	AGUAAAAA CUGAUGAG X CGAA AAUGCUUU	1302
698	AGCAUUAU U UUUACUCU	167	AGAGUAAA CUGAUGAG X CGAA AUAAUGCU	1303
699	GCAUUAUU U UUACUCUU	168	AAGAGUAA CUGAUGAG X CGAA AAUAAUGC	1304
700	CAUUAUUU U UACUCUUU	169	AAAGAGUA CUGAUGAG X CGAA AAAUAAUG	1305
701	AUUAUUUU U ACUCUUUU	170	AAAAGAGU CUGAUGAG X CGAA AAAAUAAU	1306
702	UUAUUUUU A CUCUUUUG	171	CAAAAGAG CUGAUGAG X CGAA AAAAAUAA	1307
705	UUUUUACU C UUUUGAGG	172	CCUCAAAA CUGAUGAG X CGAA AGUAAAAA	1308
707	UUUACUCU U UUGAGGUG	173	CACCUCAA CUGAUGAG X CGAA AGAGUAAA	1309
708	UUACUCUU U UGAGGUGA	174	UCACCUCA CUGAUGAG X CGAA AAGAGUAA	1310
709	UACUCUUU U GAGGUGAA	175	UUCACCUC CUGAUGAG X CGAA AAAGAGUA	1311
719	AGGUGAAU A UAAUUUAU	176	AUAAAUUA CUGAUGAG X CGAA AUUCACCU	1312
721	GUGAAUAU A AUUUAUAU	177	AUAUAAAU CUGAUGAG X CGAA AUAUUCAC	1313
724	AAUAUAAU U UAUAUUAC	178	GUAAUAUA CUGAUGAG X CGAA AUUAUAUU	1314
725	AUAUAAUU U AUAUUACA	179	UGUAAUAU CUGAUGAG X CGAA AAUUAUAU	1315
726	UAUAAUUU A UAUUACAA	180	UUGUAAUA CUGAUGAG X CGAA AAAUUAUA	1316
728	UAAUUUAU A UUACAAUG	181	CAUUGUAA CUGAUGAG X CGAA AUAAAUUA	1317
730	AUUUAUAU U ACAAUGUA	182	UACAUUGU CUGAUGAG X CGAA AUAUAAAU	1318
731	UUUAUAUU A CAAUGUAA	183	UUACAUUG CUGAUGAG X CGAA AAUAUAAA	1319

Table 24

738	UACAAUGU A AAAGCUUC	184	GAAGCUUU CUGAUGAG X CGAA ACAUUGUA	1320
745	UAAAAGCU U CUUUAAUA	185	UAUUAAAG CUGAUGAG X CGAA AGCUUUUA	1321
746	AAAAGCUU C UUUAAUAC	186	GUAUUAAA CUGAUGAG X CGAA AAGCUUUU	1322
748	AAGCUUCU U UAAUACUA	187	UAGUAUUA CUGAUGAG X CGAA AGAAGCUU	1323
749	AGCUUCUU U AAUACUAA	188	UUAGUAUU CUGAUGAG X CGAA AAGAAGCU	1324
750	GCUUCUUU A AUACUAAG	189	CUUAGUAU CUGAUGAG X CGAA AAAGAAGC	1325
753	UCUUUAAU A CUAAGUAU	190	AUACUUAG CUGAUGAG X CGAA AUUAAAGA	1326
756	UUAAUACU A AGUAUUUU	191	AAAAUACU CUGAUGAG X CGAA AGUAUUAA	1327
760	UACUAAGU A UUUUUCAG	192	CUGAAAAA CUGAUGAG X CGAA ACUUAGUA	1328
762	CUAAGUAU U UUUCAGGU	193	ACCUGAAA CUGAUGAG X CGAA AUACUUAG	1329
763	UAAGUAUU U UUCAGGUC	194	GACCUGAA CUGAUGAG X CGAA AAUACUUA	1330
764	AAGUAUUU U UCAGGUCU	195	AGACCUGA CUGAUGAG X CGAA AAAUACUU	1331
765	AGUAUUUU U CAGGUCUU	196	AAGACCUG CUGAUGAG X CGAA AAAAUACU	1332
766	GUAUUUUU C AGGUCUUC	197	GAAGACCU CUGAUGAG X CGAA AAAAAUAC	1333
771	UUUCAGGU C UUCACCAA	198	UUGGUGAA CUGAUGAG X CGAA ACCUGAAA	1334
773	UCAGGUCU U CACCAAGU	199	ACUUGGUG CUGAUGAG X CGAA AGACCUGA	1335
774	CAGGUCUU C ACCAAGUA	200	UACUUGGU CUGAUGAG X CGAA AAGACCUG	1336
782	CACCAAGU A UCAAAGUA	201	UACUUUGA CUGAUGAG X CGAA ACUUGGUG	1337
784	CCAAGUAU C AAAGUAAU	202	AUUACUUU CUGAUGAG X CGAA AUACUUGG	1338
790	AUCAAAGU A AUAACACA	203	UGUGUUAU CUGAUGAG X CGAA ACUUUGAU	1339
793	AAAGUAAU A ACACAAAU	204	AUUUGUGU CUGAUGAG X CGAA AUUACUUU	1340
809	UGAAGUGU C AUUAUUCA	205	UGAAUAAU CUGAUGAG X CGAA ACACUUCA	1341
812	AGUGUCAU U AUUCAAAA	206	UUUUGAAU CUGAUGAG X CGAA AUGACACU	1342
813	GUGUCAUU A UUCAAAAU	207	AUUUUGAA CUGAUGAG X CGAA AAUGACAC	1343
815	GUCAUUAU U CAAAAUAG	208	CUAUUUUG CUGAUGAG X CGAA AUAAUGAC	1344
816	UCAUUAUU C AAAAUAGU	209	ACUAUUUU CUGAUGAG X CGAA AAUAAUGA	1345
822	UUCAAAAU A GUCCACUG	210	CAGUGGAC CUGAUGAG X CGAA AUUUUGAA	1346
825	AAAAUAGU C CACUGACU	211	AGUCAGUG CUGAUGAG X CGAA ACUAUUUU	1347
834	CACUGACU C CUCACAUC	212	GAUGUGAG CUGAUGAG X CGAA AGUCAGUG	1348
837	UGACUCCU C ACAUCUGU	213	ACAGAUGU CUGAUGAG X CGAA AGGAGUCA	1349
842	CCUCACAU C UGUUAUCU	214	AGAUAACA CUGAUGAG X CGAA AUGUGAGG	1350
846	ACAUCUGU U AUCUUAUU	215	AAUAAGAU CUGAUGAG X CGAA ACAGAUGU	1351
847	CAUCUGUU A UCUUAUUA	216	UAAUAAGA CUGAUGAG X CGAA AACAGAUG	1352
849	UCUGUUAU C UUAUUAUA	217	UAUAAUAA CUGAUGAG X CGAA AUAACAGA	1353
851	UGUUAUCU U AUUAUAAA	218	UUUAUAAU CUGAUGAG X CGAA AGAUAACA	1354
852	GUUAUCUU A UUAUAAAG	219	CUUUAUAA CUGAUGAG X CGAA AAGAUAAC	1355
854	UAUCUUAU U AUAAAGAA	220	UUCUUUAU CUGAUGAG X CGAA AUAAGAUA	1356
855	AUCUUAUU A UAAAGAAC	221	GUUCUUUA CUGAUGAG X CGAA AAUAAGAU	1357
857	CUUAUUAU A AAGAACUA	222	UAGUUCUU CUGAUGAG X CGAA AUAAUAAG	1358
865	AAAGAACU A UUUGUAGU	223	ACUACAAA CUGAUGAG X CGAA AGUUCUUU	1359
867	AGAACUAU U UGUAGUAA	224	UUACUACA CUGAUGAG X CGAA AUAGUUCU	1360
868	GAACUAUU U GUAGUAAC	225	GUUACUAC CUGAUGAG X CGAA AAUAGUUC	1361
871	CUAUUUGU A GUAACUAU	226	AUAGUUAC CUGAUGAG X CGAA ACAAAUAG	1362
874	UUUGUAGU A ACUAUCAG	227	CUGAUAGU CUGAUGAG X CGAA ACUACAAA	1363
878	UAGUAACU A UCAGAAUC	228	GAUUCUGA CUGAUGAG X CGAA AGUUACUA	1364
880	GUAACUAU C AGAAUCUA	229	UAGAUUCU CUGAUGAG X CGAA AUAGUUAC	1365
886	AUCAGAAU C UACAUUCU	230	AGAAUGUA CUGAUGAG X CGAA AUUCUGAU	1366

Table 24

888	CAGAAUCU A CAUUCUAA	231	UUAGAAUG CUGAUGAG X CGAA AGAUUCUG	1367
892	AUCUACAU U CUAAAACA	232	UGUUUUAG CUGAUGAG X CGAA AUGUAGAU	1368
893	UCUACAUU C UAAAACAG	233	CUGUUUUA CUGAUGAG X CGAA AAUGUAGA	1369
895	UACAUUCU A AAACAGAA	234	UUCUGUUU CUGAUGAG X CGAA AGAAUGUA	1370
906	ACAGAAAU U GUAUUUUU	235	AAAAAUAC CUGAUGAG X CGAA AUUUCUGU	1371
909	GAAAUUGU A UUUUUUCU	236	AGAAAAAA CUGAUGAG X CGAA ACAAUUUC	1372
911	AAUUGUAU U UUUUCUAU	237	AUAGAAAA CUGAUGAG X CGAA AUACAAUU	1373
912	AUUGUAUU U UUUCUAUG	238	CAUAGAAA CUGAUGAG X CGAA AAUACAAU	1374
913	UUGUAUUU U UUCUAUGC	239	GCAUAGAA CUGAUGAG X CGAA AAAUACAA	1375
914	UGUAUUUU U UCUAUGCC	240	GGCAUAGA CUGAUGAG X CGAA AAAAUACA	1376
915	GUAUUUUU U CUAUGCCA	241	UGGCAUAG CUGAUGAG X CGAA AAAAAUAC	1377
916	UAUUUUUU C UAUGCCAC	242	GUGGCAUA CUGAUGAG X CGAA AAAAAAUA	1378
918	UUUUUUCU A UGCCACAU	243	AUGUGGCA CUGAUGAG X CGAA AGAAAAAA	1379
927	UGCCACAU U AACAUCUU	244	AAGAUGUU CUGAUGAG X CGAA AUGUGGCA	1380
928	GCCACAUU A ACAUCUUU	245	AAAGAUGU CUGAUGAG X CGAA AAUGUGGC	1381
933	AUUAACAU C UUUUAAAG	246	CUUUAAAA CUGAUGAG X CGAA AUGUUAAU	1382
935	UAACAUCU U UUAAAGUU	247	AACUUUAA CUGAUGAG X CGAA AGAUGUUA	1383
936	AACAUCUU U UAAAGUUG	248	CAACUUUA CUGAUGAG X CGAA AAGAUGUU	1384
937	ACAUCUUU U AAAGUUGA	249	UCAACUUU CUGAUGAG X CGAA AAAGAUGU	1385
938	CAUCUUUU A AAGUUGAU	250	AUCAACUU CUGAUGAG X CGAA AAAAGAUG	1386
943	UUUAAAGU U GAUGAGAA	251	UUCUCAUC CUGAUGAG X CGAA ACUUUAAA	1387
953	AUGAGAAU C AAGUAUGG	252	CCAUACUU CUGAUGAG X CGAA AUUCUCAU	1388
958	AAUCAAGU A UGGAAAAG	253	CUUUUCCA CUGAUGAG X CGAA ACUUGAUU	1389
968	GGAAAAGU A AGGCCAUA	254	UAUGGCCU CUGAUGAG X CGAA ACUUUUCC	1390
976	AAGGCCAU A CUCUUACA	255	UGUAAGAG CUGAUGAG X CGAA AUGGCCUU	1391
979	GCCAUACU C UUACAUAA	256	UUAUGUAA CUGAUGAG X CGAA AGUAUGGC	1392
981	CAUACUCU U ACAUAAUA	257	UAUUAUGU CUGAUGAG X CGAA AGAGUAUG	1393
982	AUACUCUU A CAUAAUAA	258	UUAUUAUG CUGAUGAG X CGAA AAGAGUAU	1394
986	UCUUACAU A AUAAAAUU	259	AAUUUUAU CUGAUGAG X CGAA AUGUAAGA	1395
989	UACAUAAU A AAAUUCCU	260	AGGAAUUU CUGAUGAG X CGAA AUUAUGUA	1396
994	AAUAAAAU U CCUUUUAA	261	UUAAAAGG CUGAUGAG X CGAA AUUUUAUU	1397
995	AUAAAAUU C CUUUUAAG	262	CUUAAAAG CUGAUGAG X CGAA AAUUUUAU	1398
998	AAAUUCCU U UUAAGUAA	263	UUACUUAA CUGAUGAG X CGAA AGGAAUUU	1399
999	AAUUCCUU U UAAGUAAU	264	AUUACUUA CUGAUGAG X CGAA AAGGAAUU	1400
1000	AUUCCUUU U AAGUAAUU	265	AAUUACUU CUGAUGAG X CGAA AAAGGAAU	1401
1001	UUCCUUUU A AGUAAUUU	266	AAAUUACU CUGAUGAG X CGAA AAAAGGAA	1402
1005	UUUUAAGU A AUUUUUUC	267	GAAAAAAU CUGAUGAG X CGAA ACUUAAAA	1403
1008	UAAGUAAU U UUUUCAAA	268	UUUGAAAA CUGAUGAG X CGAA AUUACUUA	1404
1009	AAGUAAUU U UUUCAAAG	269	CUUUGAAA CUGAUGAG X CGAA AAUUACUU	1405
1010	AGUAAUUU U UUCAAAGA	270	UCUUUGAA CUGAUGAG X CGAA AAAUUACU	1406
1011	GUAAUUUU U UCAAAGAA	271	UUCUUUGA CUGAUGAG X CGAA AAAAUUAC	1407
1012	UAAUUUUU U CAAAGAAU	272	AUUCUUUG CUGAUGAG X CGAA AAAAAUUA	1408
1013	AAUUUUUU C AAAGAAUC	273	GAUUCUUU CUGAUGAG X CGAA AAAAAAUU	1409
1021	CAAAGAAU C ACAGAAUU	274	AAUUCUGU CUGAUGAG X CGAA AUUCUUUG	1410
1029	CACAGAAU U CUAGUACA	275	UGUACUAG CUGAUGAG X CGAA AUUCUGUG	1411
1030	ACAGAAUU C UAGUACAU	276	AUGUACUA CUGAUGAG X CGAA AAUUCUGU	1412
1032	AGAAUUCU A GUACAUGU	277	ACAUGUAC CUGAUGAG X CGAA AGAAUUCU	1413

Table 24

1035	AUUCUAGU A CAUGUAGG	278	CCUACAUG CUGAUGAG X CGAA ACUAGAAU	1414
1041	GUACAUGU A GGUAAAUC	279	GAUUUACC CUGAUGAG X CGAA ACAUGUAC	1415
1045	AUGUAGGU A AAUCAUAA	280	UUAUGAUU CUGAUGAG X CGAA ACCUACAU	1416
1049	AGGUAAAU C AUAAAUCU	281	AGAUUUAU CUGAUGAG X CGAA AUUUACCU	1417
1052	UAAAUCAU A AAUCUGUU	282	AACAGAUU CUGAUGAG X CGAA AUGAUUUA	1418
1056	UCAUAAAU C UGUUCUAA	283	UUAGAACA CUGAUGAG X CGAA AUUUAUGA	1419
1060	AAAUCUGU U CUAAGACA	284	UGUCUUAG CUGAUGAG X CGAA ACAGAUUU	1420
1061	AAUCUGUU C UAAGACAU	285	AUGUCUUA CUGAUGAG X CGAA AACAGAUU	1421
1063	UCUGUUCU A AGACAUAU	286	AUAUGUCU CUGAUGAG X CGAA AGAACAGA	1422
1070	UAAGACAU A UGAUCAAC	287	GUUGAUCA CUGAUGAG X CGAA AUGUCUUA	1423
1075	CAUAUGAU C AACAGAUG	288	CAUCUGUU CUGAUGAG X CGAA AUCAUAUG	1424
1096	CUGGUGGU U AAUAUGUG	289	CACAUAUU CUGAUGAG X CGAA ACCACCAG	1425
1097	UGGUGGUU A AUAUGUGA	290	UCACAUAU CUGAUGAG X CGAA AACCACCA	1426
1100	UGGUUAAU A UGUGACAG	291	CUGUCACA CUGAUGAG X CGAA AUUAACCA	1427
1115	AGUGAGAU U AGUCAUAU	292	AUAUGACU CUGAUGAG X CGAA AUCUCACU	1428
1116	GUGAGAUU A GUCAUAUC	293	GAUAUGAC CUGAUGAG X CGAA AAUCUCAC	1429
1119	AGAUUAGU C AUAUCACU	294	AGUGAUAU CUGAUGAG X CGAA ACUAAUCU	1430
1122	UUAGUCAU A UCACUAAU	295	AUUAGUGA CUGAUGAG X CGAA AUGACUAA	1431
1124	AGUCAUAU C ACUAAUAU	296	AUAUUAGU CUGAUGAG X CGAA AUAUGACU	1432
1128	AUAUCACU A AUAUACUA	297	UAGUAUAU CUGAUGAG X CGAA AGUGAUAU	1433
1131	UCACUAAU A UACUAACA	298	UGUUAGUA CUGAUGAG X CGAA AUUAGUGA	1434
1133	ACUAAUAU A CUAACAAC	299	GUUGUUAG CUGAUGAG X CGAA AUAUUAGU	1435
1136	AAUAUACU A ACAACAGA	300	UCUGUUGU CUGAUGAG X CGAA AGUAUAUU	1436
1147	AACAGAAU C UAAUCUUC	301	GAAGAUUA CUGAUGAG X CGAA AUUCUGUU	1437
1149	CAGAAUCU A AUCUUCAU	302	AUGAAGAU CUGAUGAG X CGAA AGAUUCUG	1438
1152	AAUCUAAU C UUCAUUUA	303	UAAAUGAA CUGAUGAG X CGAA AUUAGAUU	1439
1154	UCUAAUCU U CAUUUAAG	304	CUUAAAUG CUGAUGAG X CGAA AGAUUAGA	1440
1155	CUAAUCUU C AUUUAAGG	305	CCUUAAAU CUGAUGAG X CGAA AAGAUUAG	1441
1158	AUCUUCAU U UAAGGCAC	306	GUGCCUUA CUGAUGAG X CGAA AUGAAGAU	1442
1159	UCUUCAUU U AAGGCACU	307	AGUGCCUU CUGAUGAG X CGAA AAUGAAGA	1443
1160	CUUCAUUU A AGGCACUG	308	CAGUGCCU CUGAUGAG X CGAA AAAUGAAG	1444
1170	GGCACUGU A GUGAAUUA	309	UAAUUCAC CUGAUGAG X CGAA ACAGUGCC	1445
1177	UAGUGAAU U AUCUGAGC	310	GCUCAGAU CUGAUGAG X CGAA AUUCACUA	1446
1178	AGUGAAUU A UCUGAGCU	311	AGCUCAGA CUGAUGAG X CGAA AAUUCACU	1447
1180	UGAAUUAU C UGAGCUAG	312	CUAGCUCA CUGAUGAG X CGAA AUAAUUCA	1448
1187	UCUGAGCU A GAGUUACC	313	GGUAACUC CUGAUGAG X CGAA AGCUCAGA	1449
1192	GCUAGAGU U ACCUAGCU	314	AGCUAGGU CUGAUGAG X CGAA ACUCUAGC	1450
1193	CUAGAGUU A CCUAGCUU	315	AAGCUAGG CUGAUGAG X CGAA AACUCUAG	1451
1197	AGUUACCU A GCUUACCA	316	UGGUAAGC CUGAUGAG X CGAA AGGUAACU	1452
1201	ACCUAGCU U ACCAUACU	317	AGUAUGGU CUGAUGAG X CGAA AGCUAGGU	1453
1202	CCUAGCUU A CCAUACUA	318	UAGUAUGG CUGAUGAG X CGAA AAGCUAGG	1454
1207	CUUACCAU A CUAUAUCU	319	AGAUAUAG CUGAUGAG X CGAA AUGGUAAG	1455
1210	ACCAUACU A UAUCUUUG	320	CAAAGAUA CUGAUGAG X CGAA AGUAUGGU	1456
1212	CAUACUAU A UCUUUGGA	321	UCCAAAGA CUGAUGAG X CGAA AUAGUAUG	1457
1214	UACUAUAU C UUUGGAAU	322	AUUCCAAA CUGAUGAG X CGAA AUAUAGUA	1458
1216	CUAUAUCU U UGGAAUCA	323	UGAUUCCA CUGAUGAG X CGAA AGAUAUAG	1459
1217	UAUAUCUU U GGAAUCAU	324	AUGAUUCC CUGAUGAG X CGAA AAGAUAUA	1460

Table 24

1223	UUUGGAAU C AUGAAACC	325	GGUUUCAU CUGAUGAG X CGAA AUUCCAAA	1461
1233	UGAAACCU U AAGACUUC	326	GAAGUCUU CUGAUGAG X CGAA AGGUUUCA	1462
1234	GAAACCUU A AGACUUCA	327	UGAAGUCU CUGAUGAG X CGAA AAGGUUUC	1463
1240	UUAAGACU U CAGAAUGA	328	UCAUUCUG CUGAUGAG X CGAA AGUCUUAA	1464
1241	UAAGACUU C AGAAUGAU	329	AUCAUUCU CUGAUGAG X CGAA AAGUCUUA	1465
1250	AGAAUGAU U UUGCAGGU	330	ACCUGCAA CUGAUGAG X CGAA AUCAUUCU	1466
1251	GAAUGAUU U UGCAGGUU	331	AACCUGCA CUGAUGAG X CGAA AAUCAUUC	1467
1252	AAUGAUUU U GCAGGUUG	332	CAACCUGC CUGAUGAG X CGAA AAAUCAUU	1468
1259	UUGCAGGU U GUCUUCCA	333	UGGAAGAC CUGAUGAG X CGAA ACCUGCAA	1469
1262	CAGGUUGU C UUCCAUUC	334	GAAUGGAA CUGAUGAG X CGAA ACAACCUG	1470
1264	GGUUGUCU U CCAUUCCA	335	UGGAAUGG CUGAUGAG X CGAA AGACAACC	1471
1265	GUUGUCUU C CAUUCCAG	336	CUGGAAUG CUGAUGAG X CGAA AAGACAAC	1472
1269	UCUUCCAU U CCAGCCUA	337	UAGGCUGG CUGAUGAG X CGAA AUGGAAGA	1473
1270	CUUCCAUU C CAGCCUAA	338	UUAGGCUG CUGAUGAG X CGAA AAUGGAAG	1474
1277	UCCAGCCU A ACAUCCAA	339	UUGGAUGU CUGAUGAG X CGAA AGGCUGGA	1475
1282	CCUAACAU C CAAUGCAG	340	CUGCAUUG CUGAUGAG X CGAA AUGUUAGG	1476
1302	AGGAAAAU A AAAGAUUU	341	AAAUCUUU CUGAUGAG X CGAA AUUUUCCU	1477
1309	UAAAAGAU U UCCAGUGA	342	UCACUGGA CUGAUGAG X CGAA AUCUUUUA	1478
1310	AAAAGAUU U CCAGUGAC	343	GUCACUGG CUGAUGAG X CGAA AAUCUUUU	1479
1311	AAAGAUUU C CAGUGACA	344	UGUCACUG CUGAUGAG X CGAA AAAUCUUU	1480
1327	AGAAAAAU A UAUUAUCU	345	AGAUAAUA CUGAUGAG X CGAA AUUUUUCU	1481
1329	AAAAAUAU A UUAUCUCA	346	UGAGAUAA CUGAUGAG X CGAA AUAUUUUU	1482
1331	AAAUAUAU U AUCUCAAG	347	CUUGAGAU CUGAUGAG X CGAA AUAUAUUU	1483
1332	AAUAUAUU A UCUCAAGU	348	ACUUGAGA CUGAUGAG X CGAA AAUAUAUU	1484
1334	UAUAUUAU C UCAAGUAU	349	AUACUUGA CUGAUGAG X CGAA AUAAUAUA	1485
1336	UAUUAUCU C AAGUAUUU	350	AAAUACUU CUGAUGAG X CGAA AGAUAAUA	1486
1341	UCUCAAGU A UUUUUUAA	351	UUAAAAAA CUGAUGAG X CGAA ACUUGAGA	1487
1343	UCAAGUAU U UUUUAAAA	352	UUUUAAAA CUGAUGAG X CGAA AUACUUGA	1488
1344	CAAGUAUU U UUUAAAAA	353	UUUUUAAA CUGAUGAG X CGAA AAUACUUG	1489
1345	AAGUAUUU U UUAAAAAU	354	AUUUUUAA CUGAUGAG X CGAA AAAUACUU	1490
1346	AGUAUUUU U UAAAAAUA	355	UAUUUUUA CUGAUGAG X CGAA AAAAUACU	1491
1347	GUAUUUUU U AAAAAUAU	356	AUAUUUUU CUGAUGAG X CGAA AAAAAUAC	1492
1348	UAUUUUUU A AAAAUAUA	357	UAUAUUUU CUGAUGAG X CGAA AAAAAAUA	1493
1354	UUAAAAAU A UAUGAAUU	358	AAUUCAUA CUGAUGAG X CGAA AUUUUUAA	1494
1356	AAAAAUAU A UGAAUUCU	359	AGAAUUCA CUGAUGAG X CGAA AUAUUUUU	1495
1362	AUAUGAAU U CUCUCUCC	360	GGAGAGAG CUGAUGAG X CGAA AUUCAUAU	1496
1363	UAUGAAUU C UCUCUCCA	361	UGGAGAGA CUGAUGAG X CGAA AAUUCAUA	1497
1365	UGAAUUCU C UCUCCAAA	362	UUUGGAGA CUGAUGAG X CGAA AGAAUUCA	1498
1367	AAUUCUCU C UCCAAAUA	363	UAUUUGGA CUGAUGAG X CGAA AGAGAAUU	1499
1369	UUCUCUCU C CAAAUAUU	364	AAUAUUUG CUGAUGAG X CGAA AGAGAGAA	1500
1375	CUCCAAAU A UUAACUAA	365	UUAGUUAA CUGAUGAG X CGAA AUUUGGAG	1501
1377	CCAAAUAU U AACUAAUU	366	AAUUAGUU CUGAUGAG X CGAA AUAUUUGG	1502
1378	CAAAUAUU A ACUAAUUA	367	UAAUUAGU CUGAUGAG X CGAA AAUAUUUG	1503
1382	UAUUAACU A AUUAUUAG	368	CUAAUAAU CUGAUGAG X CGAA AGUUAAUA	1504
1385	UAACUAAU U AUUAGAUU	369	AAUCUAAU CUGAUGAG X CGAA AUUAGUUA	1505
1386	AACUAAUU A UUAGAUUA	370	UAAUCUAA CUGAUGAG X CGAA AAUUAGUU	1506
1388	CUAAUUAU U AGAUUAUA	371	UAUAAUCU CUGAUGAG X CGAA AUAAUUAG	1507

Table 24

1389	UAAUUAUU A GAUUAUAU	372	AUAUAAUC CUGAUGAG X CGAA AAUAAUUA	1508
1393	UAUUAGAU U AUAUUUUG	373	CAAAAUAU CUGAUGAG X CGAA AUCUAAUA	1509
1394	AUUAGAUU A UAUUUUGA	374	UCAAAAUA CUGAUGAG X CGAA AAUCUAAU	1510
1396	UAGAUUAU A UUUUGAAA	375	UUUCAAAA CUGAUGAG X CGAA AUAAUCUA	1511
1398	GAUUAUAU U UUGAAAUG	376	CAUUUCAA CUGAUGAG X CGAA AUAUAAUC	1512
1399	AUUAUAUU U UGAAAUGA	377	UCAUUUCA CUGAUGAG X CGAA AAUAUAAU	1513
1400	UUAUAUUU U GAAAUGAA	378	UUCAUUUC CUGAUGAG X CGAA AAAUAUAA	1514
1411	AAUGAACU U GUUGGCCC	379	GGGCCAAC CUGAUGAG X CGAA AGUUCAUU	1515
1414	GAACUUGU U GGCCCAUC	380	GAUGGGCC CUGAUGAG X CGAA ACAAGUUC	1516
1422	UGGCCCAU C UAUUACAU	381	AUGUAAUA CUGAUGAG X CGAA AUGGGCCA	1517
1424	GCCCAUCU A UUACAUCU	382	AGAUGUAA CUGAUGAG X CGAA AGAUGGGC	1518
1426	CCAUCUAU U ACAUCUAC	383	GUAGAUGU CUGAUGAG X CGAA AUAGAUGG	1519
1427	CAUCUAUU A CAUCUACA	384	UGUAGAUG CUGAUGAG X CGAA AAUAGAUG	1520
1431	UAUUACAU C UACAGCUG	385	CAGCUGUA CUGAUGAG X CGAA AUGUAAUA	1521
1433	UUACAUCU A CAGCUGAC	386	GUCAGCUG CUGAUGAG X CGAA AGAUGUAA	1522
1445	CUGACCCU U GAACAUGG	387	CCAUGUUC CUGAUGAG X CGAA AGGGUCAG	1523
1458	AUGGGGGU U AGGGGAGC	388	GCUCCCCU CUGAUGAG X CGAA ACCCCCAU	1524
1459	UGGGGGUU A GGGGAGCU	389	AGCUCCCC CUGAUGAG X CGAA AACCCCCA	1525
1474	CUGACAAU U CGUGGGUC	390	GACCCACG CUGAUGAG X CGAA AUUGUCAG	1526
1475	UGACAAUU C GUGGGUCC	391	GGACCCAC CUGAUGAG X CGAA AAUUGUCA	1527
1482	UCGUGGGU C CGCAAAAU	392	AUUUUGCG CUGAUGAG X CGAA ACCCACGA	1528
1491	CGCAAAAU C UUAACUAC	393	GUAGUUAA CUGAUGAG X CGAA AUUUUGCG	1529
1493	CAAAAUCU U AACUACCU	394	AGGUAGUU CUGAUGAG X CGAA AGAUUUUG	1530
1494	AAAAUCUU A ACUACCUA	395	UAGGUAGU CUGAUGAG X CGAA AAGAUUUU	1531
1498	UCUUAACU A CCUAAUAG	396	CUAUUAGG CUGAUGAG X CGAA AGUUAAGA	1532
1502	AACUACCU A AUAGCCUA	397	UAGGCUAU CUGAUGAG X CGAA AGGUAGUU	1533
1505	UACCUAAU A GCCUACUA	398	UAGUAGGC CUGAUGAG X CGAA AUUAGGUA	1534
1510	AAUAGCCU A CUAUUGAC	399	GUCAAUAG CUGAUGAG X CGAA AGGCUAUU	1535
1513	AGCCUACU A UUGACCAU	400	AUGGUCAA CUGAUGAG X CGAA AGUAGGCU	1536
1515	CCUACUAU U GACCAUAA	401	UUAUGGUC CUGAUGAG X CGAA AUAGUAGG	1537
1522	UUGACCAU A AACCUUAC	402	GUAAGGUU CUGAUGAG X CGAA AUGGUCAA	1538
1528	AUAAACCU U ACUGAUAA	403	UUAUCAGU CUGAUGAG X CGAA AGGUUUAU	1539
1529	UAAACCUU A CUGAUAAC	404	GUUAUCAG CUGAUGAG X CGAA AAGGUUUA	1540
1535	UUACUGAU A ACAUAAAC	405	GUUUAUGU CUGAUGAG X CGAA AUCAGUAA	1541
1540	GAUAACAU A AACAGUAA	406	UUACUGUU CUGAUGAG X CGAA AUGUUAUC	1542
1547	UAAACAGU A AAUUAACA	407	UGUUAAUU CUGAUGAG X CGAA ACUGUUUA	1543
1551	CAGUAAAU U AACACAUA	408	UAUGUGUU CUGAUGAG X CGAA AUUUACUG	1544
1552	AGUAAAUU A ACACAUAU	409	AUAUGUGU CUGAUGAG X CGAA AAUUUACU	1545
1559	UAACACAU A UUUUGCGU	410	ACGCAAAA CUGAUGAG X CGAA AUGUGUUA	1546
1561	ACACAUAU U UUGCGUGU	411	ACACGCAA CUGAUGAG X CGAA AUAUGUGU	1547
1562	CACAUAUU U UGCGUGUU	412	AACACGCA CUGAUGAG X CGAA AAUAUGUG	1548
1563	ACAUAUUU U GCGUGUUA	413	UAACACGC CUGAUGAG X CGAA AAAUAUGU	1549
1570	UUGCGUGU U AUAUGUAU	414	AUACAUAU CUGAUGAG X CGAA ACACGCAA	1550
1571	UGCGUGUU A UAUGUAUU	415	AAUACAUA CUGAUGAG X CGAA AACACGCA	1551
1573	CGUGUUAU A UGUAUUAU	416	AUAAUACA CUGAUGAG X CGAA AUAACACG	1552
1577	UUAUAUGU A UUAUACAC	417	GUGUAUAA CUGAUGAG X CGAA ACAUAUAA	1553
1579	AUAUGUAU U AUACACUA	418	UAGUGUAU CUGAUGAG X CGAA AUACAUAU	1554

Table 24

1580	UAUGUAUU A UACACUAU	419	AUAGUGUA CUGAUGAG X CGAA AAUACAUA	1555
1582	UGUAUUAU A CACUAUAU	420	AUAUAGUG CUGAUGAG X CGAA AUAAUACA	1556
1587	UAUACACU A UAUUCCUA	421	UAGGAAUA CUGAUGAG X CGAA AGUGUAUA	1557
1589	UACACUAU A UUCCUACA	422	UGUAGGAA CUGAUGAG X CGAA AUAGUGUA	1558
1591	CACUAUAU U CCUACAAU	423	AUUGUAGG CUGAUGAG X CGAA AUAUAGUG	1559
1592	ACUAUAUU C CUACAAUA	424	UAUUGUAG CUGAUGAG X CGAA AAUAUAGU	1560
1595	AUAUUCCU A CAAUAAAG	425	CUUUAUUG CUGAUGAG X CGAA AGGAAUAU	1561
1600	CCUACAAU A AAGUAAGC	426	GCUUACUU CUGAUGAG X CGAA AUUGUAGG	1562
1605	AAUAAAGU A AGCUAGAG	427	CUCUAGCU CUGAUGAG X CGAA ACUUUAUU	1563
1610	AGUAAGCU A GAGAAAAU	428	AUUUUCUC CUGAUGAG X CGAA AGCUUACU	1564
1621	GAAAAUGU U AUUUAGAA	429	UUCUAAAU CUGAUGAG X CGAA ACAUUUUC	1565
1622	AAAAUGUU A UUUAGAAA	430	UUUCUAAA CUGAUGAG X CGAA AACAUUUU	1566
1624	AAUGUUAU U UAGAAAAU	431	AUUUUCUA CUGAUGAG X CGAA AUAACAUU	1567
1625	AUGUUAUU U AGAAAAUC	432	GAUUUUCU CUGAUGAG X CGAA AAUAACAU	1568
1626	UGUUAUUU A GAAAAUCA	433	UGAUUUUC CUGAUGAG X CGAA AAAUAACA	1569

Input Sequence = PLN. Cut Site = UH/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
PLN (Homo sapiens phospholamban (PLN) mRNA.; 1635 bp)

Table 25

Table 25: Human Phospholamban (PLN) NCH Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
15	CAGAAAAC U AGCUAAAC	434	GUUUAGCU CUGAUGAG X CGAA IUUUUCUG	1570
17	GAAAACUC C CUAAACAC	435	GUGUUUAG CUGAUGAG X CGAA IAGUUUUC	1571
18	AAAACUCC C UAAACACC	436	GGUGUUUA CUGAUGAG X CGAA IGAGUUUU	1572
19	AAACUCCC C AAACACCC	437	GGGUGUUU CUGAUGAG X CGAA IGGAGUUU	1573
20	AACUCCCC A AACACCCG	438	CGGGUGUU CUGAUGAG X CGAA IGGGAGUU	1574
23	UCCCCAGC U ACCCGUAA	439	UUACGGGU CUGAUGAG X CGAA ICUGGGGA	1575
28	AGCUAAAC A UAAGACUU	440	AAGUCUUA CUGAUGAG X CGAA IUUUAGCU	1576
30	CUAAACAC C AGACUUCA	441	UGAAGUCU CUGAUGAG X CGAA IUGUUUAG	1577
31	UAAACACC C GACUUCAU	442	AUGAAGUC CUGAUGAG X CGAA IGUGUUUA	1578
39	CGUAAGAC U ACAACACA	443	UGUGUUGU CUGAUGAG X CGAA IUCUUACG	1579
42	AAGACUUC A ACACAAUA	444	UAUUGUGU CUGAUGAG X CGAA IAAGUCUU	1580
46	CUUCAUAC A AAUACUCU	445	AGAGUAUU CUGAUGAG X CGAA IUAUGAAG	1581
49	CAUACAAC A ACUCUAUA	446	UAUAGAGU CUGAUGAG X CGAA IUUGUAUG	1582
51	UACAACAC A UCUAUACU	447	AGUAUAGA CUGAUGAG X CGAA IUGUUGUA	1583
56	CACAAUAC U ACUGUGAU	448	AUCACAGU CUGAUGAG X CGAA IUAUUGUG	1584
58	CAAUACUC U UGUGAUGA	449	UCAUCACA CUGAUGAG X CGAA IAGUAUUG	1585
63	CUCUAUAC U UGAUCACA	450	UGUGAUCA CUGAUGAG X CGAA IUAUAGAG	1586
73	UGAUGAUC A UGCCAAGG	451	CCUUGGCA CUGAUGAG X CGAA IAUCAUCA	1587
75	AUGAUCAC A CCAAGGCU	452	AGCCUUGG CUGAUGAG X CGAA IUGAUCAU	1588
78	AUCACAGC U AGGCUACC	453	GGUAGCCU CUGAUGAG X CGAA ICUGUGAU	1589
81	ACAGCUGC C CUACCUAA	454	UUAGGUAG CUGAUGAG X CGAA ICAGCUGU	1590
82	CAGCUGCC A UACCUAAA	455	UUUAGGUA CUGAUGAG X CGAA IGCAGCUG	1591
87	GCCAAGGC U AAAAGAAG	456	CUUCUUUU CUGAUGAG X CGAA ICCUUGGC	1592
90	AAGGCUAC C AGAAGACA	457	UGUCUUCU CUGAUGAG X CGAA IUAGCCUU	1593
91	AGGCUACC U GAAGACAG	458	CUGUCUUC CUGAUGAG X CGAA IGUAGCCU	1594
102	AAGAAGAC A UCUCAUAU	459	AUAUGAGA CUGAUGAG X CGAA IUCUUCUU	1595
109	CAGUUAUC U UUUGGCUG	460	CAGCCAAA CUGAUGAG X CGAA IAUAACUG	1596
111	GUUAUCUC A UGGCUGCC	461	GGCAGCCA CUGAUGAG X CGAA IAGAUAAC	1597
120	UAUUUGGC U GCUUUUUA	462	UAAAAAGC CUGAUGAG X CGAA ICCAAAUA	1598
123	UUGGCUGC C UUUUAUCU	463	AGAUAAAA CUGAUGAG X CGAA ICAGCCAA	1599
124	UGGCUGCC A UUUAUCUU	464	AAGAUAAA CUGAUGAG X CGAA IGCAGCCA	1600
127	CUGCCAGC U AUCUUUCU	465	AGAAAGAU CUGAUGAG X CGAA ICUGGCAG	1601
135	UUUUUAUC U CUCGACCA	466	UGGUCGAG CUGAUGAG X CGAA IAUAAAAA	1602
139	UAUCUUUC U ACCACUUA	467	UAAGUGGU CUGAUGAG X CGAA IAAAGAUA	1603
141	UCUUUCUC U CACUUAAA	468	UUUAAGUG CUGAUGAG X CGAA IAGAAAGA	1604
146	CUCUCGAC C AAAACUUC	469	GAAGUUUU CUGAUGAG X CGAA IUCGAGAG	1605
147	UCUCGACC A AAACUUCA	470	UGAAGUUU CUGAUGAG X CGAA IGUCGAGA	1606
149	UCGACCAC U ACUUCAGA	471	UCUGAAGU CUGAUGAG X CGAA IUGGUCGA	1607
156	CUUAAAAC U ACUUCCUG	472	CAGGAAGU CUGAUGAG X CGAA IUUUUAAG	1608
159	AAAACUUC A UCCUGUCC	473	GGACAGGA CUGAUGAG X CGAA IAAGUUUU	1609
163	CUUCAGAC U GUCCUGCU	474	AGCAGGAC CUGAUGAG X CGAA IUCUGAAG	1610
166	CAGACUUC C CUGCUGGU	475	ACCAGCAG CUGAUGAG X CGAA IAAGUCUG	1611
167	AGACUUCC U UGCUGGUA	476	UACCAGCA CUGAUGAG X CGAA IGAAGUCU	1612
171	UUCCUGUC C GGUAUCAU	477	AUGAUACC CUGAUGAG X CGAA IACAGGAA	1613

Table 25

172	UCCUGUCC U GUAUCAUG	478	CAUGAUAC CUGAUGAG X CGAA IGACAGGA	1614
175	UGUCCUGC U UCAUGGAG	479	CUCCAUGA CUGAUGAG X CGAA ICAGGACA	1615
182	CUGGUAUC A GAAAGUCC	480	GGACUUUC CUGAUGAG X CGAA IAUACCAG	1616
194	AGAAAGUC C CCUCACUC	481	GAGUGAGG CUGAUGAG X CGAA IACUUUCU	1617
195	GAAAGUCC A CUCACUCG	482	CGAGUGAG CUGAUGAG X CGAA IGACUUUC	1618
200	UCCAAUAC C UCGCUCAG	483	CUGAGCGA CUGAUGAG X CGAA IUAUUGGA	1619
201	CCAAUACC U CGCUCAGC	484	GCUGAGCG CUGAUGAG X CGAA IGUAUUGG	1620
203	AAUACCUC A CUCAGCUA	485	UAGCUGAG CUGAUGAG X CGAA IAGGUAUU	1621
205	UACCUCAC U CAGCUAUA	486	UAUAGCUG CUGAUGAG X CGAA IUGAGGUA	1622
209	UCACUCGC U UAUAAGAA	487	UUCUUAUA CUGAUGAG X CGAA ICGAGUGA	1623
211	ACUCGCUC A UAAGAAGA	488	UCUUCUUA CUGAUGAG X CGAA IAGCGAGU	1624
214	CGCUCAGC U GAAGAGCC	489	GGCUCUUC CUGAUGAG X CGAA ICUGAGCG	1625
226	AGAAGAGC C CCAUUGAA	490	UUCAAUGG CUGAUGAG X CGAA ICUCUUCU	1626
227	GAAGAGCC U CAUUGAAA	491	UUUCAAUG CUGAUGAG X CGAA IGCUCUUC	1627
229	AGAGCCUC A UUGAAAUG	492	CAUUUCAA CUGAUGAG X CGAA IAGGCUCU	1628
232	GCCUCAAC C AAAUGCCU	493	AGGCAUUU CUGAUGAG X CGAA IUUGAGGC	1629
233	CCUCAACC A AAUGCCUC	494	GAGGCAUU CUGAUGAG X CGAA IGUUGAGG	1630
243	UGAAAUGC C CAAGCACG	495	CGUGCUUG CUGAUGAG X CGAA ICAUUUCA	1631
244	GAAAUGCC U AAGCACGU	496	ACGUGCUU CUGAUGAG X CGAA IGCAUUUC	1632
246	AAUGCCUC A GCACGUCA	497	UGACGUGC CUGAUGAG X CGAA IAGGCAUU	1633
249	GCCUCAAC A CGUCAAAA	498	UUUUGACG CUGAUGAG X CGAA IUUGAGGC	1634
253	CAACAAGC A AAAAGCUA	499	UAGCUUUU CUGAUGAG X CGAA ICUUGUUG	1635
258	AGCACGUC A CUACAGAA	500	UUCUGUAG CUGAUGAG X CGAA IACGUGCU	1636
264	UCAAAAGC U AAUCUAUU	501	AAUAGAUU CUGAUGAG X CGAA ICUUUUGA	1637
267	AAAGCUAC A CUAUUUAU	502	AUAAAUAG CUGAUGAG X CGAA IUAGCUUU	1638
273	ACAGAAUC U AUCAAUUU	503	AAAUUGAU CUGAUGAG X CGAA IAUUCUGU	1639
281	UAUUUAUC A CUGUCUCA	504	UGAGACAG CUGAUGAG X CGAA IAUAAAUA	1640
287	UCAAUUUC U CAUCUUAA	505	UUAAGAUG CUGAUGAG X CGAA IAAAUUGA	1641
291	UUUCUGUC U UUAAUAUG	506	CAUAUUAA CUGAUGAG X CGAA IACAGAAA	1642
293	UCUGUCUC A AAUAUGUC	507	GACAUAUU CUGAUGAG X CGAA IAGACAGA	1643
296	GUCUCAUC U AUGUCUCU	508	AGAGACAU CUGAUGAG X CGAA IAUGAGAC	1644
306	AAUAUGUC U CUGAUCUG	509	CAGAUCAG CUGAUGAG X CGAA IACAUAUU	1645
308	UAUGUCUC U GAUCUGUA	510	UACAGAUC CUGAUGAG X CGAA IAGACAUA	1646
312	UCUCUUGC U UGUAUCAU	511	AUGAUACA CUGAUGAG X CGAA ICAAGAGA	1647
317	UGCUGAUC U CAUCGUGA	512	UCACGAUG CUGAUGAG X CGAA IAUCAGCA	1648
323	UCUGUAUC A GAUGCUUC	513	GAAGCAUC CUGAUGAG X CGAA IAUACAGA	1649
333	CGUGAUGC U UGAAGUUC	514	GAACUUCA CUGAUGAG X CGAA ICAUCACG	1650
336	GAUGCUUC U AGUUCUGC	515	GCAGAACU CUGAUGAG X CGAA IAAGCAUC	1651
338	UGCUUCUC U UUCUGCUA	516	UAGCAGAA CUGAUGAG X CGAA IAGAAGCA	1652
346	UGAAGUUC U CAACCUCU	517	AGAGGUUG CUGAUGAG X CGAA IAACUUCA	1653
349	AGUUCUGC U CCUCUAGA	518	UCUAGAGG CUGAUGAG X CGAA ICAGAACU	1654
352	UCUGCUAC A CUAGAUCU	519	AGAUCUAG CUGAUGAG X CGAA IUAGCAGA	1655
355	GCUACAAC C GAUCUGCA	520	UGCAGAUC CUGAUGAG X CGAA IUUGUAGC	1656
356	CUACAACC U AUCUGCAG	521	CUGCAGAU CUGAUGAG X CGAA IGUUGUAG	1657
358	ACAACCUC U CUGCAGCU	522	AGCUGCAG CUGAUGAG X CGAA IAGGUUGU	1658
364	UCUAGAUC U CUUGCCAC	523	GUGGCAAG CUGAUGAG X CGAA IAUCUAGA	1659
367	AGAUCUGC A GCCACAUC	524	GAUGUGGC CUGAUGAG X CGAA ICAGAUCU	1660

Table 25

370	UCUGCAGC U ACAUCAGC	525	GCUGAUGU CUGAUGAG X CGAA ICUGCAGA	1661
374	CAGCUUGC C CAGCUUAA	526	UUAAGCUG CUGAUGAG X CGAA ICAAGCUG	1662
375	AGCUUGCC A AGCUUAAA	527	UUUAAGCU CUGAUGAG X CGAA IGCAAGCU	1663
377	CUUGCCAC A CUUAAAAU	528	AUUUUAAG CUGAUGAG X CGAA IUGGCAAG	1664
380	GCCACAUC A AAAAUCUG	529	CAGAUUUU CUGAUGAG X CGAA IAUGUGGC	1665
383	ACAUCAGC U AUCUGUCA	530	UGACAGAU CUGAUGAG X CGAA ICUGAUGU	1666
391	UUAAAAUC U UCCCAUGC	531	GCAUGGGA CUGAUGAG X CGAA IAUUUUAA	1667
395	AAUCUGUC A AUGCAGAC	532	GUCUGCAU CUGAUGAG X CGAA IACAGAUU	1668
398	CUGUCAUC C CAGACAGG	533	CCUGUCUG CUGAUGAG X CGAA IAUGACAG	1669
399	UGUCAUCC C AGACAGGA	534	UCCUGUCU CUGAUGAG X CGAA IGAUGACA	1670
400	GUCAUCCC A GACAGGAA	535	UUCCUGUC CUGAUGAG X CGAA IGGAUGAC	1671
404	UCCCAUGC A GGAAAACA	536	UGUUUUCC CUGAUGAG X CGAA ICAUGGGA	1672
408	AUGCAGAC A AACAAUAU	537	AUAUUGUU CUGAUGAG X CGAA IUCUGCAU	1673
416	AGGAAAAC A UGUAUAAC	538	GUUAUACA CUGAUGAG X CGAA IUUUUCCU	1674
429	UGUAUAAC A ACUUCCUG	539	CAGGAAGU CUGAUGAG X CGAA IUUAUACA	1675
433	UAACAGAC C CCUGAGUA	540	UACUCAGG CUGAUGAG X CGAA IUCUGUUA	1676
434	AACAGACC A CUGAGUAG	541	CUACUCAG CUGAUGAG X CGAA IGUCUGUU	1677
436	CAGACCAC U GAGUAGAA	542	UUCUACUC CUGAUGAG X CGAA IUGGUCUG	1678
439	ACCACUUC C UAGAAGAG	543	CUCUUCUA CUGAUGAG X CGAA IAAGUGGU	1679
440	CCACUUCC U AGAAGAGU	544	ACUCUUCU CUGAUGAG X CGAA IGAAGUGG	1680
456	AGAGUUUC U GAAAAGGU	545	ACCUUUUC CUGAUGAG X CGAA IAAACUCU	1681
470	AAAAGGUC A UAAGACUA	546	UAGUCUUA CUGAUGAG X CGAA IACCUUUU	1682
481	AUUAAGAC U CUUAUUGU	547	ACAAUAAG CUGAUGAG X CGAA IUCUUAAU	1683
487	ACUAAAAC U GUUACCAU	548	AUGGUAAC CUGAUGAG X CGAA IUUUUAGU	1684
497	AUUGUUAC C GUAUUCAU	549	AUGAAUAC CUGAUGAG X CGAA IUAACAAU	1685
498	UUGUUACC A UAUUCAUC	550	GAUGAAUA CUGAUGAG X CGAA IGUAACAA	1686
508	AUGUAUUC A UUGGAUCU	551	AGAUCCAA CUGAUGAG X CGAA IAAUACAU	1687
511	UAUUCAUC U GAUCUUGU	552	ACAAGAUC CUGAUGAG X CGAA IAUGAAUA	1688
520	GUUGGAUC U AACAUGAA	553	UUCAUGUU CUGAUGAG X CGAA IAUCCAAC	1689
528	UUGUAAAC A AAGGGCUU	554	AAGCCCUU CUGAUGAG X CGAA IUUUACAA	1690
539	AAAAGGGC U UUUCAAAA	555	UUUUGAAA CUGAUGAG X CGAA ICCCUUUU	1691
548	UUAUUUUC A UUAACUUC	556	GAAGUUAA CUGAUGAG X CGAA IAAAAUAA	1692
558	AAAUUAAC U AAUAAGUG	557	CACUUAUU CUGAUGAG X CGAA IUUAAUUU	1693
561	UUAACUUC A AAGUGUAU	558	AUACACUU CUGAUGAG X CGAA IAAGUUAA	1694
581	UAAAAUGC A UUGAUUUC	559	GAAAUCAA CUGAUGAG X CGAA ICAUUUUA	1695
584	AAUGCAAC U AUUUCCUC	560	GAGGAAAU CUGAUGAG X CGAA IUUGCAUU	1696
594	UUGAUUUC C CAUGGCUC	561	GAGCCAUG CUGAUGAG X CGAA IAAAUCAA	1697
595	UGAUUUCC U AUGGCUCA	562	UGAGCCAU CUGAUGAG X CGAA IGAAAUCA	1698
597	AUUUCCUC A GGCUCACA	563	UGUGAGCC CUGAUGAG X CGAA IAGGAAAU	1699
600	UCCUCAAC A UCACAAAU	564	AUUUGUGA CUGAUGAG X CGAA IUUGAGGA	1700
605	AACAUGGC U AAUUUCUA	565	UAGAAAUU CUGAUGAG X CGAA ICCAUGUU	1701
607	CAUGGCUC A UUUCUAUC	566	GAUAGAAA CUGAUGAG X CGAA IAGCCAUG	1702
609	UGGCUCAC A UCUAUCCC	567	GGGAUAGA CUGAUGAG X CGAA IUGAGCCA	1703
616	CAAAUUUC U CAAAUCUU	568	AAGAUUUG CUGAUGAG X CGAA IAAAUUUG	1704
620	UUUCUAUC C UCUUUUCU	569	AGAAAAGA CUGAUGAG X CGAA IAUAGAAA	1705
621	UUCUAUCC C CUUUUCUG	570	CAGAAAAG CUGAUGAG X CGAA IGAUAGAA	1706
622	UCUAUCCC A UUUUCUGA	571	UCAGAAAA CUGAUGAG X CGAA IGGAUAGA	1707

Table 25

627	CCCAAAUC U UGAAGAUG	572	CAUCUUCA CUGAUGAG X CGAA IAUUUGGG	1708
632	AUCUUUUC U AUGAAGAG	573	CUCUUCAU CUGAUGAG X CGAA IAAAAGAU	1709
659	UUUAAAAC U UGCCAACA	574	UGUUGGCA CUGAUGAG X CGAA IUUUUAAA	1710
662	AAAACUGC A CAACAAGU	575	ACUUGUUG CUGAUGAG X CGAA ICAGUUUU	1711
664	AACUGCAC U ACAAGUUC	576	GAACUUGU CUGAUGAG X CGAA IUGCAGUU	1712
667	UGCACUGC C AGUUCACU	577	AGUGAACU CUGAUGAG X CGAA ICAGUGCA	1713
668	GCACUGCC A GUUCACUU	578	AAGUGAAC CUGAUGAG X CGAA IGCAGUGC	1714
671	CUGCCAAC A CACUUCAU	579	AUGAAGUG CUGAUGAG X CGAA IUUGGCAG	1715
677	ACAAGUUC A AUAUAUAA	580	UUAUAUAU CUGAUGAG X CGAA IAACUUGU	1716
679	AAGUUCAC U AUAUAAAG	581	CUUUAUAU CUGAUGAG X CGAA IUGAACUU	1717
682	UUCACUUC A UAAAGCAU	582	AUGCUUUA CUGAUGAG X CGAA IAAGUGAA	1718
693	UAUAAAGC A UUUUACUC	583	GAGUAAAA CUGAUGAG X CGAA ICUUUAUA	1719
704	AUUUUUAC U UGAGGUGA	584	UCACCUCA CUGAUGAG X CGAA IUAAAAAU	1720
706	UUUUACUC U AGGUGAAU	585	AUUCACCU CUGAUGAG X CGAA IAGUAAAA	1721
733	UAUAUUAC A AAAAGCUU	586	AAGCUUUU CUGAUGAG X CGAA IUAAUAUA	1722
744	GUAAAAGC U UAAUACUA	587	UAGUAUUA CUGAUGAG X CGAA ICUUUUAC	1723
747	AAAGCUUC U UACUAAGU	588	ACUUAGUA CUGAUGAG X CGAA IAAGCUUU	1724
755	UUUAAUAC U AUUUUUCA	589	UGAAAAAU CUGAUGAG X CGAA IUAUUAAA	1725
767	UAUUUUUC A UUCACCAA	590	UUGGUGAA CUGAUGAG X CGAA IAAAAAUA	1726
772	UUCAGGUC U CAAGUAUC	591	GAUACUUG CUGAUGAG X CGAA IACCUGAA	1727
775	AGGUCUUC A GUAUCAAA	592	UUUGAUAC CUGAUGAG X CGAA IAAGACCU	1728
777	GUCUUCAC C AUCAAAGU	593	ACUUUGAU CUGAUGAG X CGAA IUGAAGAC	1729
778	UCUUCACC A UCAAAGUA	594	UACUUUGA CUGAUGAG X CGAA IGUGAAGA	1730
785	CAAGUAUC A AAUAACAC	595	GUGUUAUU CUGAUGAG X CGAA IAUACUUG	1731
796	GUAAUAAC A UGAAGUGU	596	ACACUUCA CUGAUGAG X CGAA IUUAUUAC	1732
798	AAUAACAC A AAGUGUCA	597	UGACACUU CUGAUGAG X CGAA IUGUUAUU	1733
810	GAAGUGUC A UCAAAAUA	598	UAUUUUGA CUGAUGAG X CGAA IACACUUC	1734
817	CAUUAUUC A AGUCCACU	599	AGUGGACU CUGAUGAG X CGAA IAAUAAUG	1735
826	AAAUAGUC C ACUCCUCA	600	UGAGGAGU CUGAUGAG X CGAA IACUAUUU	1736
827	AAUAGUCC A CUCCUCAC	601	GUGAGGAG CUGAUGAG X CGAA IGACUAUU	1737
829	UAGUCCAC U CCUCACAU	602	AUGUGAGG CUGAUGAG X CGAA IUGGACUA	1738
833	CCACUGAC U ACAUCUGU	603	ACAGAUGU CUGAUGAG X CGAA IUCAGUGG	1739
835	ACUGACUC C AUCUGUUA	604	UAACAGAU CUGAUGAG X CGAA IAGUCAGU	1740
836	CUGACUCC U UCUGUUAU	605	AUAACAGA CUGAUGAG X CGAA IGAGUCAG	1741
838	GACUCCUC A UGUUAUCU	606	AGAUAACA CUGAUGAG X CGAA IAGGAGUC	1742
840	CUCCUCAC A UUAUCUUA	607	UAAGAUAA CUGAUGAG X CGAA IUGAGGAG	1743
843	CUCACAUC U UCUUAUUA	608	UAAUAAGA CUGAUGAG X CGAA IAUGUGAG	1744
850	CUGUUAUC U AUAAAGAA	609	UUCUUUAU CUGAUGAG X CGAA IAUAACAG	1745
864	UAAAGAAC U GUAGUAAC	610	GUUACUAC CUGAUGAG X CGAA IUUCUUUA	1746
877	GUAGUAAC U GAAUCUAC	611	GUAGAUUC CUGAUGAG X CGAA IUUACUAC	1747
881	UAACUAUC A CUACAUUC	612	GAAUGUAG CUGAUGAG X CGAA IAUAGUUA	1748
887	UCAGAAUC U UCUAAAAC	613	GUUUUAGA CUGAUGAG X CGAA IAUUCUGA	1749
890	GAAUCUAC A AAAACAGA	614	UCUGUUUU CUGAUGAG X CGAA IUAGAUUC	1750
894	CUACAUUC U CAGAAAUU	615	AAUUUCUG CUGAUGAG X CGAA IAAUGUAG	1751
900	UCUAAAAC A UUGUAUUU	616	AAAUACAA CUGAUGAG X CGAA IUUUUAGA	1752
917	AUUUUUUC U CACAUUAA	617	UUAAUGUG CUGAUGAG X CGAA IAAAAAAU	1753
922	UUCUAUGC C UAACAUCU	618	AGAUGUUA CUGAUGAG X CGAA ICAUAGAA	1754

Table 25

923	UCUAUGCC A AACAUCUU	619	AAGAUGUU CUGAUGAG X CGAA IGCAUAGA	1755
925	UAUGCCAC A CAUCUUUU	620	AAAAGAUG CUGAUGAG X CGAA IUGGCAUA	1756
931	ACAUUAAC A UUAAAGUU	621	AACUUUAA CUGAUGAG X CGAA IUUAAUGU	1757
934	UUAACAUC U AAGUUGAU	622	AUCAACUU CUGAUGAG X CGAA IAUGUUAA	1758
954	UGAGAAUC A UGGAAAAG	623	CUUUUCCA CUGAUGAG X CGAA IAUUCUCA	1759
973	AGUAAGGC C UCUUACAU	624	AUGUAAGA CUGAUGAG X CGAA ICCUUACU	1760
974	GUAAGGCC A CUUACAUA	625	UAUGUAAG CUGAUGAG X CGAA IGCCUUAC	1761
978	GGCCAUAC U CAUAAUAA	626	UUAUUAUG CUGAUGAG X CGAA IUAUGGCC	1762
980	CCAUACUC U UAAUAAAA	627	UUUUAUUA CUGAUGAG X CGAA IAGUAUGG	1763
984	ACUCUUAC A AAAAUUCC	628	GGAAUUUU CUGAUGAG X CGAA IUAAGAGU	1764
996	UAAAAUUC C AAGUAAUU	629	AAUUACUU CUGAUGAG X CGAA IAAUUUUA	1765
997	AAAAUUCC U AGUAAUUU	630	AAAUUACU CUGAUGAG X CGAA IGAAUUUU	1766
1014	AUUUUUUC A AUCACAGA	631	UCUGUGAU CUGAUGAG X CGAA IAAAAAAU	1767
1022	AAAGAAUC A AUUCUAGU	632	ACUAGAAU CUGAUGAG X CGAA IAUUCUUU	1768
1024	AGAAUCAC A UCUAGUAC	633	GUACUAGA CUGAUGAG X CGAA IUGAUUCU	1769
1031	CAGAAUUC U CAUGUAGG	634	CCUACAUG CUGAUGAG X CGAA IAAUUCUG	1770
1037	UCUAGUAC A GGUAAAUC	635	GAUUUACC CUGAUGAG X CGAA IUACUAGA	1771
1050	GGUAAAUC A UCUGUUCU	636	AGAACAGA CUGAUGAG X CGAA IAUUUACC	1772
1057	CAUAAAUC U UAAGACAU	637	AUGUCUUA CUGAUGAG X CGAA IAUUUAUG	1773
1062	AUCUGUUC U CAUAUGAU	638	AUCAUAUG CUGAUGAG X CGAA IAACAGAU	1774
1068	UCUAAGAC A AUCAACAG	639	CUGUUGAU CUGAUGAG X CGAA IUCUUAGA	1775
1076	AUAUGAUC A AUGAGAAC	640	GUUCUCAU CUGAUGAG X CGAA IAUCAUAU	1776
1079	UGAUCAAC A AGAACUGG	641	CCAGUUCU CUGAUGAG X CGAA IUUGAUCA	1777
1089	AUGAGAAC U GUUAAUAU	642	AUAUUAAC CUGAUGAG X CGAA IUUCUCAU	1778
1107	UAUGUGAC A GAUUAGUC	643	GACUAAUC CUGAUGAG X CGAA IUCACAUA	1779
1120	GAUUAGUC A ACUAAUAU	644	AUAUUAGU CUGAUGAG X CGAA IACUAAUC	1780
1125	GUCAUAUC A UAUACUAA	645	UUAGUAUA CUGAUGAG X CGAA IAUAUGAC	1781
1127	CAUAUCAC U UACUAACA	646	UGUUAGUA CUGAUGAG X CGAA IUGAUAUG	1782
1135	UAAUAUAC U ACAGAAUC	647	GAUUCUGU CUGAUGAG X CGAA IUAUAUUA	1783
1139	AUACUAAC A AAUCUAAU	648	AUUAGAUU CUGAUGAG X CGAA IUUAGUAU	1784
1142	CUAACAAC A CUAAUCUU	649	AAGAUUAG CUGAUGAG X CGAA IUUGUUAG	1785
1148	ACAGAAUC U UUCAUUUA	650	UAAAUGAA CUGAUGAG X CGAA IAUUCUGU	1786
1153	AUCUAAUC U UUAAGGCA	651	UGCCUUAA CUGAUGAG X CGAA IAUUAGAU	1787
1156	UAAUCUUC A AGGCACUG	652	CAGUGCCU CUGAUGAG X CGAA IAAGAUUA	1788
1165	UUUAAGGC A AGUGAAUU	653	AAUUCACU CUGAUGAG X CGAA ICCUUAAA	1789
1167	UAAGGCAC U UGAAUUAU	654	AUAAUUCA CUGAUGAG X CGAA IUGCCUUA	1790
1181	GAAUUAUC U UAGAGUUA	655	UAACUCUA CUGAUGAG X CGAA IAUAAUUC	1791
1186	AUCUGAGC U UUACCUAG	656	CUAGGUAA CUGAUGAG X CGAA ICUCAGAU	1792
1195	AGAGUUAC C UUACCAUA	657	UAUGGUAA CUGAUGAG X CGAA IUAACUCU	1793
1196	GAGUUACC U UACCAUAC	658	GUAUGGUA CUGAUGAG X CGAA IGUAACUC	1794
1200	UACCUAGC U AUACUAUA	659	UAUAGUAU CUGAUGAG X CGAA ICUAGGUA	1795
1204	UAGCUUAC C UAUAUCUU	660	AAGAUAUA CUGAUGAG X CGAA IUAAGCUA	1796
1205	AGCUUACC A AUAUCUUU	661	AAAGAUAU CUGAUGAG X CGAA IGUAAGCU	1797
1209	UACCAUAC U CUUUGGAA	662	UUCCAAAG CUGAUGAG X CGAA IUAUGGUA	1798
1215	ACUAUAUC U AAUCAUGA	663	UCAUGAUU CUGAUGAG X CGAA IAUAUAGU	1799
1224	UUGGAAUC A ACCUUAAG	664	CUUAAGGU CUGAUGAG X CGAA IAUUCCAA	1800
1231	CAUGAAAC C GACUUCAG	665	CUGAAGUC CUGAUGAG X CGAA IUUUCAUG	1801

Table 25

1232	AUGAAACC U ACUUCAGA	666	UCUGAAGU CUGAUGAG X CGAA IGUUUCAU	1802
1239	CUUAAGAC U AAUGAUUU	667	AAAUCAUU CUGAUGAG X CGAA IUCUUAAG	1803
1242	AAGACUUC A GAUUUUGC	668	GCAAAAUC CUGAUGAG X CGAA IAAGUCUU	1804
1255	GAUUUUGC A GUCUUCCA	669	UGGAAGAC CUGAUGAG X CGAA ICAAAAUC	1805
1263	AGGUUGUC U UUCCAGCC	670	GGCUGGAA CUGAUGAG X CGAA IACAACCU	1806
1266	UUGUCUUC C CAGCCUAA	671	UUAGGCUG CUGAUGAG X CGAA IAAGACAA	1807
1267	UGUCUUCC A AGCCUAAC	672	GUUAGGCU CUGAUGAG X CGAA IGAAGACA	1808
1271	UUCCAUUC C UAACAUCC	673	GGAUGUUA CUGAUGAG X CGAA IAAUGGAA	1809
1272	UCCAUUCC A AACAUCCA	674	UGGAUGUU CUGAUGAG X CGAA IGAAUGGA	1810
1275	AUUCCAGC C AUCCAAUG	675	CAUUGGAU CUGAUGAG X CGAA ICUGGAAU	1811
1276	UUCCAGCC U UCCAAUGC	676	GCAUUGGA CUGAUGAG X CGAA IGCUGGAA	1812
1280	AGCCUAAC A AUGCAGGC	677	GCCUGCAU CUGAUGAG X CGAA IUUAGGCU	1813
1283	CUAACAUC C CAGGCAAG	678	CUUGCCUG CUGAUGAG X CGAA IAUGUUAG	1814
1284	UAACAUCC A AGGCAAGG	679	CCUUGCCU CUGAUGAG X CGAA IGAUGUUA	1815
1289	UCCAAUGC A AGGAAAAU	680	AUUUUCCU CUGAUGAG X CGAA ICAUUGGA	1816
1293	AUGCAGGC A AAAUAAAA	681	UUUUAUUU CUGAUGAG X CGAA ICCUGCAU	1817
1312	AAGAUUUC C ACAGAAAA	682	UUUUCUGU CUGAUGAG X CGAA IAAAUCUU	1818
1313	AGAUUUCC A CAGAAAAA	683	UUUUUCUG CUGAUGAG X CGAA IGAAAUCU	1819
1319	CCAGUGAC A AAUAUAUU	684	AAUAUAUU CUGAUGAG X CGAA IUCACUGG	1820
1335	AUAUUAUC U UAUUUUUU	685	AAAAAAUA CUGAUGAG X CGAA IAUAAUAU	1821
1337	AUUAUCUC A UUUUUUAA	686	UUAAAAAA CUGAUGAG X CGAA IAGAUAAU	1822
1364	AUGAAUUC U CCAAAUAU	687	AUAUUUGG CUGAUGAG X CGAA IAAUUCAU	1823
1366	GAAUUCUC U AAAUAUUA	688	UAAUAUUU CUGAUGAG X CGAA IAGAAUUC	1824
1368	AUUCUCUC U AUAUUAAC	689	GUUAAUAU CUGAUGAG X CGAA IAGAGAAU	1825
1370	UCUCUCUC C AUUAACUA	690	UAGUUAAU CUGAUGAG X CGAA IAGAGAGA	1826
1371	CUCUCUCC A UUAACUAA	691	UUAGUUAA CUGAUGAG X CGAA IGAGAGAG	1827
1381	AUAUUAAC U AUUAGAUU	692	AAUCUAAU CUGAUGAG X CGAA IUUAAUAU	1828
1410	AAAUGAAC U GGCCCAUC	693	GAUGGGCC CUGAUGAG X CGAA IUUCAUUU	1829
1418	UUGUUGGC C UAUUACAU	694	AUGUAAUA CUGAUGAG X CGAA ICCAACAA	1830
1419	UGUUGGCC C AUUACAUC	695	GAUGUAAU CUGAUGAG X CGAA IGCCAACA	1831
1420	GUUGGCCC A UUACAUCU	696	AGAUGUAA CUGAUGAG X CGAA IGGCCAAC	1832
1423	GGCCCAUC U CAUCUACA	697	UGUAGAUG CUGAUGAG X CGAA IAUGGGCC	1833
1429	UCUAUUAC A CAGCUGAC	698	GUCAGCUG CUGAUGAG X CGAA IUAAUAGA	1834
1432	AUUACAUC U CUGACCCU	699	AGGGUCAG CUGAUGAG X CGAA IAUGUAAU	1835
1435	ACAUCUAC A ACCCUUGA	700	UCAAGGGU CUGAUGAG X CGAA IUAGAUGU	1836
1438	UCUACAGC U CUUGAACA	701	UGUUCAAG CUGAUGAG X CGAA ICUGUAGA	1837
1442	CAGCUGAC C AACAUGGG	702	CCCAUGUU CUGAUGAG X CGAA IUCAGCUG	1838
1443	AGCUGACC C ACAUGGGG	703	CCCCAUGU CUGAUGAG X CGAA IGUCAGCU	1839
1444	GCUGACCC U CAUGGGGG	704	CCCCCAUG CUGAUGAG X CGAA IGGUCAGC	1840
1450	CCUUGAAC A GGUUAGGG	705	CCCUAACC CUGAUGAG X CGAA IUUCAAGG	1841
1467	AGGGGAGC U AUUCGUGG	706	CCACGAAU CUGAUGAG X CGAA ICUCCCCU	1842
1471	GAGCUGAC A GUGGGUCC	707	GGACCCAC CUGAUGAG X CGAA IUCAGCUC	1843
1483	CGUGGGUC C AAUCUUAA	708	UUAAGAUU CUGAUGAG X CGAA IACCCACG	1844
1486	GGGUCCGC A CUUAACUA	709	UAGUUAAG CUGAUGAG X CGAA ICGGACCC	1845
1492	GCAAAAUC U UACCUAAU	710	AUUAGGUA CUGAUGAG X CGAA IAUUUUGC	1846
1497	AUCUUAAC U AAUAGCCU	711	AGGCUAUU CUGAUGAG X CGAA IUUAAGAU	1847
1500	UUAACUAC C AGCCUACU	712	AGUAGGCU CUGAUGAG X CGAA IUAGUUAA	1848

Table 25

1501	UAACUACC U GCCUACUA	713	UAGUAGGC CUGAUGAG X CGAA IGUAGUUA	1849
1508	CUAAUAGC C AUUGACCA	714	UGGUCAAU CUGAUGAG X CGAA ICUAUUAG	1850
1509	UAAUAGCC U UUGACCAU	715	AUGGUCAA CUGAUGAG X CGAA IGCUAUUA	1851
1512	UAGCCUAC U ACCAUAAA	716	UUUAUGGU CUGAUGAG X CGAA IUAGGCUA	1852
1519	CUAUUGAC C ACCUUACU	717	AGUAAGGU CUGAUGAG X CGAA IUCAAUAG	1853
1520	UAUUGACC A CCUUACUG	718	CAGUAAGG CUGAUGAG X CGAA IGUCAAUA	1854
1526	CCAUAAAC C UGAUAACA	719	UGUUAUCA CUGAUGAG X CGAA IUUUAUGG	1855
1527	CAUAAACC U GAUAACAU	720	AUGUUAUC CUGAUGAG X CGAA IGUUUAUG	1856
1531	AACCUUAC U ACAUAAAC	721	GUUUAUGU CUGAUGAG X CGAA IUAAGGUU	1857
1538	CUGAUAAC A CAGUAAAU	722	AUUUACUG CUGAUGAG X CGAA IUUAUCAG	1858
1544	ACAUAAAC A AUUAACAC	723	GUGUUAAU CUGAUGAG X CGAA IUUUAUGU	1859
1555	AAAUUAAC A UUUUGCGU	724	ACGCAAAA CUGAUGAG X CGAA IUUAAUUU	1860
1557	AUUAACAC A UUGCGUGU	725	ACACGCAA CUGAUGAG X CGAA IUGUUAAU	1861
1584	UAUUAUAC A AUUCCUAC	726	GUAGGAAU CUGAUGAG X CGAA IUAUAAUA	1862
1586	UUAUACAC U UCCUACAA	727	UUGUAGGA CUGAUGAG X CGAA IUGUAUAA	1863
1593	CUAUAUUC C AUAAAGUA	728	UACUUUAU CUGAUGAG X CGAA IAAUAUAG	1864
1594	UAUAUUCC U UAAAGUAA	729	UUACUUUA CUGAUGAG X CGAA IGAAUAUA	1865
1597	AUUCCUAC A AGUAAGCU	730	AGCUUACU CUGAUGAG X CGAA IUAGGAAU	1866
1609	AAGUAAGC U AAAAUGUU	731	AACAUUUU CUGAUGAG X CGAA ICUUACUU	1867

Input Sequence = PLN. Cut Site = CH/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
PLN (Homo sapiens phospholamban (PLN) mRNA.; 1635 bp)

Table 26

Table 26: Human Phospholamban (PLN) G-cleaver Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
64	UCUAUACU G UGAUGAUC	732	GAUCAUCA UGAUG GCAUGCACUAUGC GCG AGUAUAGA	1868
66	UAUACUGU G AUGAUCAC	733	GUGAUCAU UGAUG GCAUGCACUAUGC GCG ACAGUAUA	1869
69	ACUGUGAU G AUCACAGC	734	GCUGUGAU UGAUG GCAUGCACUAUGC GCG AUCACAGU	1870
79	UCACAGCU G CCAAGGCU	735	AGCCUUGG UGAUG GCAUGCACUAUGC GCG AGCUGUGA	1871
121	AUUUGGCU G CCAGCUUU	736	AAAGCUGG UGAUG GCAUGCACUAUGC GCG AGCCAAAU	1872
143	UUUCUCUC G ACCACUUA	737	UAAGUGGU UGAUG GCAUGCACUAUGC GCG GAGAGAAA	1873
168	GACUUCCU G UCCUGCUG	738	CAGCAGGA UGAUG GCAUGCACUAUGC GCG AGGAAGUC	1874
173	CCUGUCCU G CUGGUAUC	739	GAUACCAG UGAUG GCAUGCACUAUGC GCG AGGACAGG	1875
207	CCUCACUC G CUCAGCUA	740	UAGCUGAG UGAUG GCAUGCACUAUGC GCG GAGUGAGG	1876
236	CAACCAUU G AAAUGCCU	741	AGGCAUUU UGAUG GCAUGCACUAUGC GCG AAUGGUUG	1877
241	AUUGAAAU G CCUCAACA	742	UGUUGAGG UGAUG GCAUGCACUAUGC GCG AUUUCAAU	1878
288	CAAUUUCU G UCUCAUCU	743	AGAUGAGA UGAUG GCAUGCACUAUGC GCG AGAAAUUG	1879
303	CUUAAUAU G UCUCUUGC	744	GCAAGAGA UGAUG GCAUGCACUAUGC GCG AUAUUAAG	1880
310	UGUCUCUU G CUGAUCUG	745	CAGAUCAG UGAUG GCAUGCACUAUGC GCG AAGAGACA	1881
313	CUCUUGCU G AUCUGUAU	746	AUACAGAU UGAUG GCAUGCACUAUGC GCG AGCAAGAG	1882
318	GCUGAUCU G UAUCAUCG	747	CGAUGAUA UGAUG GCAUGCACUAUGC GCG AGAUCAGC	1883
328	AUCAUCGU G AUGCUUCU	748	AGAAGCAU UGAUG GCAUGCACUAUGC GCG ACGAUGAU	1884
331	AUCGUGAU G CUUCUCUG	749	CAGAGAAG UGAUG GCAUGCACUAUGC GCG AUCACGAU	1885
339	GCUUCUCU G AAGUUCUG	750	CAGAACUU UGAUG GCAUGCACUAUGC GCG AGAGAAGC	1886
347	GAAGUUCU G CUACAACC	751	GGUUGUAG UGAUG GCAUGCACUAUGC GCG AGAACUUC	1887
365	CUAGAUCU G CAGCUUGC	752	GCAAGCUG UGAUG GCAUGCACUAUGC GCG AGAUCUAG	1888
372	UGCAGCUU G CCACAUCA	753	UGAUGUGG UGAUG GCAUGCACUAUGC GCG AAGCUGCA	1889
392	UAAAAUCU G UCAUCCCA	754	UGGGAUGA UGAUG GCAUGCACUAUGC GCG AGAUUUUA	1890
402	CAUCCCAU G CAGACAGG	755	CCUGUCUG UGAUG GCAUGCACUAUGC GCG AUGGGAUG	1891
422	ACAAUAUU G UAUAACAG	756	CUGUUAUA UGAUG GCAUGCACUAUGC GCG AAUAUUGU	1892
441	CACUUCCU G AGUAGAAG	757	CUUCUACU UGAUG GCAUGCACUAUGC GCG AGGAAGUG	1893
459	GUUUCUUU G UGAAAAGG	758	CCUUUUCA UGAUG GCAUGCACUAUGC GCG AAAGAAAC	1894
461	UUCUUUGU G AAAAGGUC	759	GACCUUUU UGAUG GCAUGCACUAUGC GCG ACAAAGAA	1895

Table 26

492	AACUUAUU G UUACCAUA	760	UAUGGUAA UGAUG GCAUGCACUAUGC GCG AAUAAGUU	1896
502	UACCAUAU G UAUUCAUC	761	GAUGAAUA UGAUG GCAUGCACUAUGC GCG AUAUGGUA	1897
512	AUUCAUCU G UUGGAUCU	762	AGAUCCAA UGAUG GCAUGCACUAUGC GCG AGAUGAAU	1898
522	UGGAUCUU G UAAACAUG	763	CAUGUUUA UGAUG GCAUGCACUAUGC GCG AAGAUCCA	1899
530	GUAAACAU G AAAAGGGC	764	GCCCUUUU UGAUG GCAUGCACUAUGC GCG AUGUUUAC	1900
570	AAAUAAGU G UAUAAAAU	765	AUUUUAUA UGAUG GCAUGCACUAUGC GCG ACUUAUUU	1901
579	UAUAAAAU G CAACUGUU	766	AACAGUUG UGAUG GCAUGCACUAUGC GCG AUUUUAUA	1902
585	AUGCAACU G UUGAUUUC	767	GAAAUCAA UGAUG GCAUGCACUAUGC GCG AGUUGCAU	1903
588	CAACUGUU G AUUUCCUC	768	GAGGAAAU UGAUG GCAUGCACUAUGC GCG AACAGUUG	1904
633	UCUUUUCU G AAGAUGAA	769	UUCAUCUU UGAUG GCAUGCACUAUGC GCG AGAAAAGA	1905
639	CUGAAGAU G AAGAGUUU	770	AAACUCUU UGAUG GCAUGCACUAUGC GCG AUCUUCAG	1906
660	UUAAAACU G CACUGCCA	771	UGGCAGUG UGAUG GCAUGCACUAUGC GCG AGUUUUAA	1907
665	ACUGCACU G CCAACAAG	772	CUUGUUGG UGAUG GCAUGCACUAUGC GCG AGUGCAGU	1908
710	ACUCUUUU G AGGUGAAU	773	AUUCACCU UGAUG GCAUGCACUAUGC GCG AAAAGAGU	1909
715	UUUGAGGU G AAUAUAAU	774	AUUAUAUU UGAUG GCAUGCACUAUGC GCG ACCUCAAA	1910
736	AUUACAAU G UAAAAGCU	775	AGCUUUUA UGAUG GCAUGCACUAUGC GCG AUUGUAAU	1911
802	ACACAAAU G AAGUGUCA	776	UGACACUU UGAUG GCAUGCACUAUGC GCG AUUUGUGU	1912
807	AAUGAAGU G UCAUUAUU	777	AAUAAUGA UGAUG GCAUGCACUAUGC GCG ACUUCAUU	1913
830	AGUCCACU G ACUCCUCA	778	UGAGGAGU UGAUG GCAUGCACUAUGC GCG AGUGGACU	1914
844	UCACAUCU G UUAUCUUA	779	UAAGAUAA UGAUG GCAUGCACUAUGC GCG AGAUGUGA	1915
869	AACUAUUU G UAGUAACU	780	AGUUACUA UGAUG GCAUGCACUAUGC GCG AAAUAGUU	1916
907	CAGAAAUU G UAUUUUUU	781	AAAAAAUA UGAUG GCAUGCACUAUGC GCG AAUUUCUG	1917
920	UUUUCUAU G CCACAUUA	782	UAAUGUGG UGAUG GCAUGCACUAUGC GCG AUAGAAAA	1918
944	UUAAAGUU G AUGAGAAU	783	AUUCUCAU UGAUG GCAUGCACUAUGC GCG AACUUUAA	1919
947	AAGUUGAU G AGAAUCAA	784	UUGAUUCU UGAUG GCAUGCACUAUGC GCG AUCAACUU	1920
1039	UAGUACAU G UAGGUAAA	785	UUUACCUA UGAUG GCAUGCACUAUGC GCG AUGUACUA	1921
1058	AUAAAUCU G UUCUAAGA	786	UCUUAGAA UGAUG GCAUGCACUAUGC GCG AGAUUUAU	1922
1072	AGACAUAU G AUCAACAG	787	CUGUUGAU UGAUG GCAUGCACUAUGC GCG AUAUGUCU	1923
1083	CAACAGAU G AGAACUGG	788	CCAGUUCU UGAUG GCAUGCACUAUGC GCG AUCUGUUG	1924
1102	GUUAAUAU G UGACAGUG	789	CACUGUCA UGAUG GCAUGCACUAUGC GCG AUAUUAAC	1925
1104	UAAUAUGU G ACAGUGAG	790	CUCACUGU UGAUG GCAUGCACUAUGC GCG ACAUAUUA	1926

Table 26

1110	GUGACAGU G AGAUUAGU	791	ACUAAUCU UGAUG GCAUGCACUAUGC GCG ACUGUCAC	1927
1168	AAGGCACU G UAGUGAAU	792	AUUCACUA UGAUG GCAUGCACUAUGC GCG AGUGCCUU	1928
1173	ACUGUAGU G AAUUAUCU	793	AGAUAAUU UGAUG GCAUGCACUAUGC GCG ACUACAGU	1929
1182	AAUUAUCU G AGCUAGAG	794	CUCUAGCU UGAUG GCAUGCACUAUGC GCG AGAUAAUU	1930
1226	GGAAUCAU G AAACCUUA	795	UAAGGUUU UGAUG GCAUGCACUAUGC GCG AUGAUUCC	1931
1247	UUCAGAAU G AUUUUGCA	796	UGCAAAAU UGAUG GCAUGCACUAUGC GCG AUUCUGAA	1932
1253	AUGAUUUU G CAGGUUGU	797	ACAACCUG UGAUG GCAUGCACUAUGC GCG AAAAUCAU	1933
1260	UGCAGGUU G UCUUCCAU	798	AUGGAAGA UGAUG GCAUGCACUAUGC GCG AACCUGCA	1934
1287	CAUCCAAU G CAGGCAAG	799	CUUGCCUG UGAUG GCAUGCACUAUGC GCG AUUGGAUG	1935
1316	UUUCCAGU G ACAGAAAA	800	UUUUCUGU UGAUG GCAUGCACUAUGC GCG ACUGGAAA	1936
1358	AAAUAUAU G AAUUCUCU	801	AGAGAAUU UGAUG GCAUGCACUAUGC GCG AUAUAUUU	1937
1401	UAUAUUUU G AAAUGAAC	802	GUUCAUUU UGAUG GCAUGCACUAUGC GCG AAAAUAUA	1938
1406	UUUGAAAU G AACUUGUU	803	AACAAGUU UGAUG GCAUGCACUAUGC GCG AUUUCAAA	1939
1412	AUGAACUU G UUGGCCCA	804	UGGGCCAA UGAUG GCAUGCACUAUGC GCG AAGUUCAU	1940
1439	CUACAGCU G ACCCUUGA	805	UCAAGGGU UGAUG GCAUGCACUAUGC GCG AGCUGUAG	1941
1446	UGACCCUU G AACAUGGG	806	CCCAUGUU UGAUG GCAUGCACUAUGC GCG AAGGGUCA	1942
1468	GGGGAGCU G ACAAUUCG	807	CGAAUUGU UGAUG GCAUGCACUAUGC GCG AGCUCCCC	1943
1484	GUGGGUCC G CAAAAUCU	808	AGAUUUUG UGAUG GCAUGCACUAUGC GCG GGACCCAC	1944
1516	CUACUAUU G ACCAUAAA	809	UUUAUGGU UGAUG GCAUGCACUAUGC GCG AAUAGUAG	1945
1532	ACCUUACU G AUAACAUA	810	UAUGUUAU UGAUG GCAUGCACUAUGC GCG AGUAAGGU	1946
1564	CAUAUUUU G CGUGUUAU	811	AUAACACG UGAUG GCAUGCACUAUGC GCG AAAAUAUG	1947
1568	UUUUGCGU G UUAUAUGU	812	ACAUAUAA UGAUG GCAUGCACUAUGC GCG ACGCAAAA	1948
1575	UGUUAUAU G UAUUAUAC	813	GUAUAAUA UGAUG GCAUGCACUAUGC GCG AUAUAACA	1949
1619	GAGAAAAU G UUAUUUAG	814	CUAAAUAA UGAUG GCAUGCACUAUGC GCG AUUUUCUC	1950

Input Sequence = PLN. Cut Site = YG/M or UG/U.
Stem Length = 8. Core Sequence = UGAUG GCAUGCACUAUGC GCG
PLN (Homo sapiens phospholamban (PLN) mRNA.; 1635 bp)

Table 27

Table 27: Human Phospholamban (PLN) zinzyme Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
64	UCUAUACU G UGAUGAUC	732	GAUCAUCA GCCGAAAGGCGAGUCAAGGUCU AGUAUAGA	1951
79	UCACAGCU G CCAAGGCU	735	AGCCUUGG GCCGAAAGGCGAGUCAAGGUCU AGCUGUGA	1952
121	AUUUGGCU G CCAGCUUU	736	AAAGCUGG GCCGAAAGGCGAGUCAAGGUCU AGCCAAAU	1953
168	GACUUCCU G UCCUGCUG	738	CAGCAGGA GCCGAAAGGCGAGUCAAGGUCU AGGAAGUC	1954
173	CCUGUCCU G CUGGUAUC	739	GAUACCAG GCCGAAAGGCGAGUCAAGGUCU AGGACAGG	1955
207	CCUCACUC G CUCAGCUA	740	UAGCUGAG GCCGAAAGGCGAGUCAAGGUCU GAGUGAGG	1956
241	AUUGAAAU G CCUCAACA	742	UGUUGAGG GCCGAAAGGCGAGUCAAGGUCU AUUUCAAU	1957
288	CAAUUUCU G UCUCAUCU	743	AGAUGAGA GCCGAAAGGCGAGUCAAGGUCU AGAAAUUG	1958
303	CUUAAUAU G UCUCUUGC	744	GCAAGAGA GCCGAAAGGCGAGUCAAGGUCU AUAUUAAG	1959
310	UGUCUCUU G CUGAUCUG	745	CAGAUCAG GCCGAAAGGCGAGUCAAGGUCU AAGAGACA	1960
318	GCUGAUCU G UAUCAUCG	747	CGAUGAUA GCCGAAAGGCGAGUCAAGGUCU AGAUCAGC	1961
331	AUCGUGAU G CUUCUCUG	749	CAGAGAAG GCCGAAAGGCGAGUCAAGGUCU AUCACGAU	1962
347	GAAGUUCU G CUACAACC	751	GGUUGUAG GCCGAAAGGCGAGUCAAGGUCU AGAACUUC	1963
365	CUAGAUCU G CAGCUUGC	752	GCAAGCUG GCCGAAAGGCGAGUCAAGGUCU AGAUCUAG	1964
372	UGCAGCUU G CCACAUCA	753	UGAUGUGG GCCGAAAGGCGAGUCAAGGUCU AAGCUGCA	1965
392	UAAAAUCU G UCAUCCCA	754	UGGGAUGA GCCGAAAGGCGAGUCAAGGUCU AGAUUUUA	1966
402	CAUCCCAU G CAGACAGG	755	CCUGUCUG GCCGAAAGGCGAGUCAAGGUCU AUGGGAUG	1967
422	ACAAUAUU G UAUAACAG	756	CUGUUAUA GCCGAAAGGCGAGUCAAGGUCU AAUAUUGU	1968
459	GUUUCUUU G UGAAAAGG	758	CCUUUUCA GCCGAAAGGCGAGUCAAGGUCU AAAGAAAC	1969
492	AACUUAUU G UUACCAUA	760	UAUGGUAA GCCGAAAGGCGAGUCAAGGUCU AAUAAGUU	1970
502	UACCAUAU G UAUUCAUC	761	GAUGAAUA GCCGAAAGGCGAGUCAAGGUCU AUAUGGUA	1971
512	AUUCAUCU G UUGGAUCU	762	AGAUCCAA GCCGAAAGGCGAGUCAAGGUCU AGAUGAAU	1972
522	UGGAUCUU G UAAACAUG	763	CAUGUUUA GCCGAAAGGCGAGUCAAGGUCU AAGAUCCA	1973
570	AAAUAAGU G UAUAAAAU	765	AUUUUAUA GCCGAAAGGCGAGUCAAGGUCU ACUUAUUU	1974
579	UAUAAAAU G CAACUGUU	766	AACAGUUG GCCGAAAGGCGAGUCAAGGUCU AUUUUAUA	1975
585	AUGCAACU G UUGAUUUC	767	GAAAUCAA GCCGAAAGGCGAGUCAAGGUCU AGUUGCAU	1976
660	UUAAAACU G CACUGCCA	771	UGGCAGUG GCCGAAAGGCGAGUCAAGGUCU AGUUUUAA	1977
665	ACUGCACU G CCAACAAG	772	CUUGUUGG GCCGAAAGGCGAGUCAAGGUCU AGUGCAGU	1978

Table 27

736	AUUACAAU G UAAAAGCU	775	AGCUUUUA GCCGAAAGGCGAGUCAAGGUCU AUUGUAAU	1979
807	AAUGAAGU G UCAUUAUU	777	AAUAAUGA GCCGAAAGGCGAGUCAAGGUCU ACUUCAUU	1980
844	UCACAUCU G UUAUCUUA	779	UAAGAUAA GCCGAAAGGCGAGUCAAGGUCU AGAUGUGA	1981
869	AACUAUUU G UAGUAACU	780	AGUUACUA GCCGAAAGGCGAGUCAAGGUCU AAAUAGUU	1982
907	CAGAAAUU G UAUUUUUU	781	AAAAAAUA GCCGAAAGGCGAGUCAAGGUCU AAUUUCUG	1983
920	UUUUCUAU G CCACAUUA	782	UAAUGUGG GCCGAAAGGCGAGUCAAGGUCU AUAGAAAA	1984
1039	UAGUACAU G UAGGUAAA	785	UUUACCUA GCCGAAAGGCGAGUCAAGGUCU AUGUACUA	1985
1058	AUAAAUCU G UUCUAAGA	786	UCUUAGAA GCCGAAAGGCGAGUCAAGGUCU AGAUUUAU	1986
1102	GUUAAUAU G UGACAGUG	789	CACUGUCA GCCGAAAGGCGAGUCAAGGUCU AUAUUAAC	1987
1168	AAGGCACU G UAGUGAAU	792	AUUCACUA GCCGAAAGGCGAGUCAAGGUCU AGUGCCUU	1988
1253	AUGAUUUU G CAGGUUGU	797	ACAACCUG GCCGAAAGGCGAGUCAAGGUCU AAAAUCAU	1989
1260	UGCAGGUU G UCUUCCAU	798	AUGGAAGA GCCGAAAGGCGAGUCAAGGUCU AACCUGCA	1990
1287	CAUCCAAU G CAGGCAAG	799	CUUGCCUG GCCGAAAGGCGAGUCAAGGUCU AUUGGAUG	1991
1412	AUGAACUU G UUGGCCCA	804	UGGGCCAA GCCGAAAGGCGAGUCAAGGUCU AAGUUCAU	1992
1484	GUGGGUCC G CAAAAUCU	808	AGAUUUUG GCCGAAAGGCGAGUCAAGGUCU GGACCCAC	1993
1564	CAUAUUUU G CGUGUUAU	811	AUAACACG GCCGAAAGGCGAGUCAAGGUCU AAAAUAUG	1994
1568	UUUUGCGU G UUAUAUGU	812	ACAUAUAA GCCGAAAGGCGAGUCAAGGUCU ACGCAAAA	1995
1575	UGUUAUAU G UAUUAUAC	813	GUAUAAUA GCCGAAAGGCGAGUCAAGGUCU AUAUAACA	1996
1619	GAGAAAAU G UUAUUUAG	814	CUAAAUAA GCCGAAAGGCGAGUCAAGGUCU AUUUUCUC	1997
21	ACUCCCCA G CUAAACAC	815	GUGUUUAG GCCGAAAGGCGAGUCAAGGUCU UGGGGAGU	1998
32	AAACACCC G UAAGACUU	816	AAGUCUUA GCCGAAAGGCGAGUCAAGGUCU GGGUGUUU	1999
76	UGAUCACA G CUGCCAAG	817	CUUGGCAG GCCGAAAGGCGAGUCAAGGUCU UGUGAUCA	2000
85	CUGCCAAG G CUACCUAA	818	UUAGGUAG GCCGAAAGGCGAGUCAAGGUCU CUUGGCAG	2001
103	AGAAGACA G UUAUCUCA	819	UGAGAUAA GCCGAAAGGCGAGUCAAGGUCU UGUCUUCU	2002
118	CAUAUUUG G CUGCCAGC	820	GCUGGCAG GCCGAAAGGCGAGUCAAGGUCU CAAAUAUG	2003
125	GGCUGCCA G CUUUUUAU	821	AUAAAAAG GCCGAAAGGCGAGUCAAGGUCU UGGCAGCC	2004
177	UCCUGCUG G UAUCAUGG	822	CCAUGAUA GCCGAAAGGCGAGUCAAGGUCU CAGCAGGA	2005
191	UGGAGAAA G UCCAAUAC	823	GUAUUGGA GCCGAAAGGCGAGUCAAGGUCU UUUCUCCA	2006
212	CUCGCUCA G CUAUAAGA	824	UCUUAUAG GCCGAAAGGCGAGUCAAGGUCU UGAGCGAG	2007
224	UAAGAAGA G CCUCAACC	825	GGUUGAGG GCCGAAAGGCGAGUCAAGGUCU UCUUCUUA	2008
251	CUCAACAA G CACGUCAA	826	UUGACGUG GCCGAAAGGCGAGUCAAGGUCU UUGUUGAG	2009

Table 27

255	ACAAGCAC G UCAAAAGC	827	GCUUUUGA GCCGAAAGGCGAGUCAAGGUCU GUGCUUGU	2010
262	CGUCAAAA G CUACAGAA	828	UUCUGUAG GCCGAAAGGCGAGUCAAGGUCU UUUUGACG	2011
326	GUAUCAUC G UGAUGCUU	829	AAGCAUCA GCCGAAAGGCGAGUCAAGGUCU GAUGAUAC	2012
342	UCUCUGAA G UUCUGCUA	830	UAGCAGAA GCCGAAAGGCGAGUCAAGGUCU UUCAGAGA	2013
368	GAUCUGCA G CUUGCCAC	831	GUGGCAAG GCCGAAAGGCGAGUCAAGGUCU UGCAGAUC	2014
381	CCACAUCA G CUUAAAAU	832	AUUUUAAG GCCGAAAGGCGAGUCAAGGUCU UGAUGUGG	2015
443	CUUCCUGA G UAGAAGAG	833	CUCUUCUA GCCGAAAGGCGAGUCAAGGUCU UCAGGAAG	2016
451	GUAGAAGA G UUUCUUUG	834	CAAAGAAA GCCGAAAGGCGAGUCAAGGUCU UCUUCUAC	2017
467	GUGAAAAG G UCAAGAUU	835	AAUCUUGA GCCGAAAGGCGAGUCAAGGUCU CUUUUCAC	2018
537	UGAAAAGG G CUUUAUUU	836	AAAUAAAG GCCGAAAGGCGAGUCAAGGUCU CCUUUUCA	2019
568	CAAAAUAA G UGUAUAAA	837	UUUAUACA GCCGAAAGGCGAGUCAAGGUCU UUAUUUUG	2020
603	UCAACAUG G CUCACAAA	838	UUUGUGAG GCCGAAAGGCGAGUCAAGGUCU CAUGUUGA	2021
644	GAUGAAGA G UUUAGUUU	839	AAACUAAA GCCGAAAGGCGAGUCAAGGUCU UCUUCAUC	2022
649	AGAGUUUA G UUUUAAAA	840	UUUUAAAA GCCGAAAGGCGAGUCAAGGUCU UAAACUCU	2023
673	GCCAACAA G UUCACUUC	841	GAAGUGAA GCCGAAAGGCGAGUCAAGGUCU UUGUUGGC	2024
691	UAUAUAAA G CAUUAUUU	842	AAAUAAUG GCCGAAAGGCGAGUCAAGGUCU UUUAUAUA	2025
713	CUUUUGAG G UGAAUAUA	843	UAUAUUCA GCCGAAAGGCGAGUCAAGGUCU CUCAAAAG	2026
742	AUGUAAAA G CUUCUUUA	844	UAAAGAAG GCCGAAAGGCGAGUCAAGGUCU UUUUACAU	2027
758	AAUACUAA G UAUUUUUC	845	GAAAAAUA GCCGAAAGGCGAGUCAAGGUCU UUAGUAUU	2028
769	UUUUUCAG G UCUUCACC	846	GGUGAAGA GCCGAAAGGCGAGUCAAGGUCU CUGAAAAA	2029
780	UUCACCAA G UAUCAAAG	847	CUUUGAUA GCCGAAAGGCGAGUCAAGGUCU UUGGUGAA	2030
788	GUAUCAAA G UAAUAACA	848	UGUUAUUA GCCGAAAGGCGAGUCAAGGUCU UUUGAUAC	2031
805	CAAAUGAA G UGUCAUUA	849	UAAUGACA GCCGAAAGGCGAGUCAAGGUCU UUCAUUUG	2032
823	UCAAAAUA G UCCACUGA	850	UCAGUGGA GCCGAAAGGCGAGUCAAGGUCU UAUUUUGA	2033
872	UAUUUGUA G UAACUAUC	851	GAUAGUUA GCCGAAAGGCGAGUCAAGGUCU UACAAAUA	2034
941	CUUUUAAA G UUGAUGAG	852	CUCAUCAA GCCGAAAGGCGAGUCAAGGUCU UUUAAAAG	2035
956	AGAAUCAA G UAUGGAAA	853	UUUCCAUA GCCGAAAGGCGAGUCAAGGUCU UUGAUUCU	2036
966	AUGGAAAA G UAAGGCCA	854	UGGCCUUA GCCGAAAGGCGAGUCAAGGUCU UUUUCCAU	2037
971	AAAGUAAG G CCAUACUC	855	GAGUAUGG GCCGAAAGGCGAGUCAAGGUCU CUUACUUU	2038
1003	CCUUUUAA G UAAUUUUU	856	AAAAAUUA GCCGAAAGGCGAGUCAAGGUCU UUAAAAGG	2039
1033	GAAUUCUA G UACAUGUA	857	UACAUGUA GCCGAAAGGCGAGUCAAGGUCU UAGAAUUC	2040

Table 27

1043	ACAUGUAG G UAAAUCAU	858	AUGAUUUA GCCGAAAGGCGAGUCAAGGUCU CUACAUGU	2041
1091	GAGAACUG G UGGUUAAU	859	AUUAACCA GCCGAAAGGCGAGUCAAGGUCU CAGUUCUC	2042
1094	AACUGGUG G UUAAUAUG	860	CAUAUUAA GCCGAAAGGCGAGUCAAGGUCU CACCAGUU	2043
1108	AUGUGACA G UGAGAUUA	861	UAAUCUCA GCCGAAAGGCGAGUCAAGGUCU UGUCACAU	2044
1117	UGAGAUUA G UCAUAUCA	862	UGAUAUGA GCCGAAAGGCGAGUCAAGGUCU UAAUCUCA	2045
1163	CAUUUAAG G CACUGUAG	863	CUACAGUG GCCGAAAGGCGAGUCAAGGUCU CUUAAAUG	2046
1171	GCACUGUA G UGAAUUAU	864	AUAAUUCA GCCGAAAGGCGAGUCAAGGUCU UACAGUGC	2047
1184	UUAUCUGA G CUAGAGUU	865	AACUCUAG GCCGAAAGGCGAGUCAAGGUCU UCAGAUAA	2048
1190	GAGCUAGA G UUACCUAG	866	CUAGGUAA GCCGAAAGGCGAGUCAAGGUCU UCUAGCUC	2049
1198	GUUACCUA G CUUACCAU	867	AUGGUAAG GCCGAAAGGCGAGUCAAGGUCU UAGGUAAC	2050
1257	UUUUGCAG G UUGUCUUC	868	GAAGACAA GCCGAAAGGCGAGUCAAGGUCU CUGCAAAA	2051
1273	CCAUUCCA G CCUAACAU	869	AUGUUAGG GCCGAAAGGCGAGUCAAGGUCU UGGAAUGG	2052
1291	CAAUGCAG G CAAGGAAA	870	UUUCCUUG GCCGAAAGGCGAGUCAAGGUCU CUGCAUUG	2053
1314	GAUUUCCA G UGACAGAA	871	UUCUGUCA GCCGAAAGGCGAGUCAAGGUCU UGGAAAUC	2054
1339	UAUCUCAA G UAUUUUUU	872	AAAAAAUA GCCGAAAGGCGAGUCAAGGUCU UUGAGAUA	2055
1416	ACUUGUUG G CCCAUCUA	873	UAGAUGGG GCCGAAAGGCGAGUCAAGGUCU CAACAAGU	2056
1436	CAUCUACA G CUGACCCU	874	AGGGUCAG GCCGAAAGGCGAGUCAAGGUCU UGUAGAUG	2057
1456	ACAUGGGG G UUAGGGGA	875	UCCCCUAA GCCGAAAGGCGAGUCAAGGUCU CCCCAUGU	2058
1465	UUAGGGGA G CUGACAAU	876	AUUGUCAG GCCGAAAGGCGAGUCAAGGUCU UCCCCUAA	2059
1476	GACAAUUC G UGGGUCCG	877	CGGACCCA GCCGAAAGGCGAGUCAAGGUCU GAAUUGUC	2060
1480	AUUCGUGG G UCCGCAAA	878	UUUGCGGA GCCGAAAGGCGAGUCAAGGUCU CCACGAAU	2061
1506	ACCUAAUA G CCUACUAU	879	AUAGUAGG GCCGAAAGGCGAGUCAAGGUCU UAUUAGGU	2062
1545	CAUAAACA G UAAAUUAA	880	UUAAUUUA GCCGAAAGGCGAGUCAAGGUCU UGUUUAUG	2063
1566	UAUUUUGC G UGUUAUAU	881	AUAUAACA GCCGAAAGGCGAGUCAAGGUCU GCAAAAUA	2064
1603	ACAAUAAA G UAAGCUAG	882	CUAGCUUA GCCGAAAGGCGAGUCAAGGUCU UUUAUUGU	2065
1607	UAAAGUAA G CUAGAGAA	883	UUCUCUAG GCCGAAAGGCGAGUCAAGGUCU UUACUUUA	2066

Input Sequence = PLN. Cut Site = G/Y
Stem Length = 8 . Core Sequence = GCcgaaagGCGaGuCaaGGuCu
PLN (Homo sapiens phospholamban (PLN) mRNA.; 1635 bp)

Table 28

Table 28: Human Phospholamban (PLN) DNAzyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
44	GACUUCAU A CAACACAA	6	TTGTGTTG GGCTAGCTACAACGA ATGAAGTC	2067
54	AACACAAU A CUCUAUAC	7	GTATAGAG GGCTAGCTACAACGA ATTGTGTT	2068
59	AAUACUCU A UACUGUGA	9	TCACAGTA GGCTAGCTACAACGA AGAGTATT	2069
61	UACUCUAU A CUGUGAUG	10	CATCACAG GGCTAGCTACAACGA ATAGAGTA	2070
88	CCAAGGCU A CCUAAAAG	12	CTTTTAGG GGCTAGCTACAACGA AGCCTTGG	2071
106	AGACAGUU A UCUCAUAU	15	ATATGAGA GGCTAGCTACAACGA AACTGTCT	2072
113	UAUCUCAU A UUUGGCUG	18	CAGCCAAA GGCTAGCTACAACGA ATGAGATA	2073
132	AGCUUUUU A UCUUUCUC	25	GAGAAAGA GGCTAGCTACAACGA AAAAAGCT	2074
179	CUGCUGGU A UCAUGGAG	39	CTCCATGA GGCTAGCTACAACGA ACCAGCAG	2075
198	AGUCCAAU A CCUCACUC	42	GAGTGAGG GGCTAGCTACAACGA ATTGGACT	2076
215	GCUCAGCU A UAAGAAGA	46	TCTTCTTA GGCTAGCTACAACGA AGCTGAGC	2077
265	CAAAAGCU A CAGAAUCU	52	AGATTCTG GGCTAGCTACAACGA AGCTTTTG	2078
274	CAGAAUCU A UUUAUCAA	54	TTGATAAA GGCTAGCTACAACGA AGATTCTG	2079
278	AUCUAUUU A UCAAUUUC	57	GAAATTGA GGCTAGCTACAACGA AAATAGAT	2080
301	AUCUUAAU A UGUCUCUU	67	AAGAGACA GGCTAGCTACAACGA ATTAAGAT	2081
320	UGAUCUGU A UCAUCGUG	72	CACGATGA GGCTAGCTACAACGA ACAGATCA	2082
350	GUUCUGCU A CAACCUCU	80	AGAGGTTG GGCTAGCTACAACGA AGCAGAAC	2083
419	AAAACAAU A UUGUAUAA	91	TTATACAA GGCTAGCTACAACGA ATTGTTTT	2084
424	AAUAUUGU A UAACAGAC	93	GTCTGTTA GGCTAGCTACAACGA ACAATATT	2085
489	UAAAACUU A UUGUUACC	108	GGTAACAA GGCTAGCTACAACGA AAGTTTTA	2086
495	UUAUUGUU A CCAUAUGU	111	ACATATGG GGCTAGCTACAACGA AACAATAA	2087
500	GUUACCAU A UGUAUUCA	112	TGAATACA GGCTAGCTACAACGA ATGGTAAC	2088
504	CCAUAUGU A UUCAUCUG	113	CAGATGAA GGCTAGCTACAACGA ACATATGG	2089
542	AGGGCUUU A UUUUCAAA	123	TTTGAAAA GGCTAGCTACAACGA AAAGCCCT	2090
572	AUAAGUGU A UAAAAUGC	133	GCATTTTA GGCTAGCTACAACGA ACACTTAT	2091
617	AAAUUUCU A UCCCAAAU	144	ATTTGGGA GGCTAGCTACAACGA AGAAATTT	2092
684	CACUUCAU A UAUAAAGC	162	GCTTTATA GGCTAGCTACAACGA ATGAAGTG	2093
686	CUUCAUAU A UAAAGCAU	163	ATGCTTTA GGCTAGCTACAACGA ATATGAAG	2094
696	AAAGCAUU A UUUUUACU	166	AGTAAAAA GGCTAGCTACAACGA AATGCTTT	2095
702	UUAUUUUU A CUCUUUUG	171	CAAAAGAG GGCTAGCTACAACGA AAAAATAA	2096
719	AGGUGAAU A UAAUUUAU	176	ATAAATTA GGCTAGCTACAACGA ATTCACCT	2097
726	UAUAAUUU A UAUUACAA	180	TTGTAATA GGCTAGCTACAACGA AAATTATA	2098
728	UAAUUUAU A UUACAAUG	181	CATTGTAA GGCTAGCTACAACGA ATAAATTA	2099
731	UUUAUAUU A CAAUGUAA	183	TTACATTG GGCTAGCTACAACGA AATATAAA	2100
753	UCUUUAAU A CUAAGUAU	190	ATACTTAG GGCTAGCTACAACGA ATTAAAGA	2101
760	UACUAAGU A UUUUUCAG	192	CTGAAAAA GGCTAGCTACAACGA ACTTAGTA	2102
782	CACCAAGU A UCAAAGUA	201	TACTTTGA GGCTAGCTACAACGA ACTTGGTG	2103
813	GUGUCAUU A UUCAAAAU	207	ATTTTGAA GGCTAGCTACAACGA AATGACAC	2104
847	CAUCUGUU A UCUUAUUA	216	TAATAAGA GGCTAGCTACAACGA AACAGATG	2105
852	GUUAUCUU A UUAUAAAG	219	CTTTATAA GGCTAGCTACAACGA AAGATAAC	2106
855	AUCUUAUU A UAAAGAAC	221	GTTCTTTA GGCTAGCTACAACGA AATAAGAT	2107
865	AAAGAACU A UUUGUAGU	223	ACTACAAA GGCTAGCTACAACGA AGTTCTTT	2108
878	UAGUAACU A UCAGAAUC	228	GATTCTGA GGCTAGCTACAACGA AGTTACTA	2109
888	CAGAAUCU A CAUUCUAA	231	TTAGAATG GGCTAGCTACAACGA AGATTCTG	2110

Table 28

909	GAAAUUGU A UUUUUUCU	236	AGAAAAAA GGCTAGCTACAACGA ACAATTTC	2111
918	UUUUUUCU A UGCCACAU	243	ATGTGGCA GGCTAGCTACAACGA AGAAAAAA	2112
958	AAUCAAGU A UGGAAAAG	253	CTTTTCCA GGCTAGCTACAACGA ACTTGATT	2113
976	AAGGCCAU A CUCUUACA	255	TGTAAGAG GGCTAGCTACAACGA ATGGCCTT	2114
982	AUACUCUU A CAUAAUAA	258	TTATTATG GGCTAGCTACAACGA AAGAGTAT	2115
1035	AUUCUAGU A CAUGUAGG	278	CCTACATG GGCTAGCTACAACGA ACTAGAAT	2116
1070	UAAGACAU A UGAUCAAC	287	GTTGATCA GGCTAGCTACAACGA ATGTCTTA	2117
1100	UGGUUAAU A UGUGACAG	291	CTGTCACA GGCTAGCTACAACGA ATTAACCA	2118
1122	UUAGUCAU A UCACUAAU	295	ATTAGTGA GGCTAGCTACAACGA ATGACTAA	2119
1131	UCACUAAU A UACUAACA	298	TGTTAGTA GGCTAGCTACAACGA ATTAGTGA	2120
1133	ACUAAUAU A CUAACAAC	299	GTTGTTAG GGCTAGCTACAACGA ATATTAGT	2121
1178	AGUGAAUU A UCUGAGCU	311	AGCTCAGA GGCTAGCTACAACGA AATTCACT	2122
1193	CUAGAGUU A CCUAGCUU	315	AAGCTAGG GGCTAGCTACAACGA AACTCTAG	2123
1202	CCUAGCUU A CCAUACUA	318	TAGTATGG GGCTAGCTACAACGA AAGCTAGG	2124
1207	CUUACCAU A CUAUAUCU	319	AGATATAG GGCTAGCTACAACGA ATGGTAAG	2125
1210	ACCAUACU A UAUCUUUG	320	CAAAGATA GGCTAGCTACAACGA AGTATGGT	2126
1212	CAUACUAU A UCUUUGGA	321	TCCAAAGA GGCTAGCTACAACGA ATAGTATG	2127
1327	AGAAAAAU A UAUUAUCU	345	AGATAATA GGCTAGCTACAACGA ATTTTTCT	2128
1329	AAAAAUAU A UUAUCUCA	346	TGAGATAA GGCTAGCTACAACGA ATATTTTT	2129
1332	AAUAUAUU A UCUCAAGU	348	ACTTGAGA GGCTAGCTACAACGA AATATATT	2130
1341	UCUCAAGU A UUUUUUAA	351	TTAAAAAA GGCTAGCTACAACGA ACTTGAGA	2131
1354	UUAAAAAU A UAUGAAUU	358	AATTCATA GGCTAGCTACAACGA ATTTTTAA	2132
1356	AAAAAUAU A UGAAUUCU	359	AGAATTCA GGCTAGCTACAACGA ATATTTTT	2133
1375	CUCCAAAU A UUAACUAA	365	TTAGTTAA GGCTAGCTACAACGA ATTTGGAG	2134
1386	AACUAAUU A UUAGAUUA	370	TAATCTAA GGCTAGCTACAACGA AATTAGTT	2135
1394	AUUAGAUU A UAUUUUGA	374	TCAAAATA GGCTAGCTACAACGA AATCTAAT	2136
1396	UAGAUUAU A UUUUGAAA	375	TTTCAAAA GGCTAGCTACAACGA ATAATCTA	2137
1424	GCCCAUCU A UUACAUCU	382	AGATGTAA GGCTAGCTACAACGA AGATGGGC	2138
1427	CAUCUAUU A CAUCUACA	384	TGTAGATG GGCTAGCTACAACGA AATAGATG	2139
1433	UUACAUCU A CAGCUGAC	386	GTCAGCTG GGCTAGCTACAACGA AGATGTAA	2140
1498	UCUUAACU A CCUAAUAG	396	CTATTAGG GGCTAGCTACAACGA AGTTAAGA	2141
1510	AAUAGCCU A CUAUUGAC	399	GTCAATAG GGCTAGCTACAACGA AGGCTATT	2142
1513	AGCCUACU A UUGACCAU	400	ATGGTCAA GGCTAGCTACAACGA AGTAGGCT	2143
1529	UAAACCUU A CUGAUAAC	404	GTTATCAG GGCTAGCTACAACGA AAGGTTTA	2144
1559	UAACACAU A UUUUGCGU	410	ACGCAAAA GGCTAGCTACAACGA ATGTGTTA	2145
1571	UGCGUGUU A UAUGUAUU	415	AATACATA GGCTAGCTACAACGA AACACGCA	2146
1573	CGUGUUAU A UGUAUUAU	416	ATAATACA GGCTAGCTACAACGA ATAACACG	2147
1577	UUAUAUGU A UUAUACAC	417	GTGTATAA GGCTAGCTACAACGA ACATATAA	2148
1580	UAUGUAUU A UACACUAU	419	ATAGTGTA GGCTAGCTACAACGA AATACATA	2149
1582	UGUAUUAU A CACUAUAU	420	ATATAGTG GGCTAGCTACAACGA ATAATACA	2150
1587	UAUACACU A UAUUCCUA	421	TAGGAATA GGCTAGCTACAACGA AGTGTATA	2151
1589	UACACUAU A UUCCUACA	422	TGTAGGAA GGCTAGCTACAACGA ATAGTGTA	2152
1595	AUAUUCCU A CAAUAAAG	425	CTTTATTG GGCTAGCTACAACGA AGGAATAT	2153
1622	AAAAUGUU A UUUAGAAA	430	TTTCTAAA GGCTAGCTACAACGA AACATTTT	2154
64	UCUAUACU G UGAUGAUC	732	GATCATCA GGCTAGCTACAACGA AGTATAGA	2155
79	UCACAGCU G CCAAGGCU	735	AGCCTTGG GGCTAGCTACAACGA AGCTGTGA	2156
121	AUUUGGCU G CCAGCUUU	736	AAAGCTGG GGCTAGCTACAACGA AGCCAAAT	2157

Table 28

168	GACUUCCU G UCCUGCUG	738	CAGCAGGA GGCTAGCTACAACGA AGGAAGTC	2158
173	CCUGUCCU G CUGGUAUC	739	GATACCAG GGCTAGCTACAACGA AGGACAGG	2159
207	CCUCACUC G CUCAGCUA	740	TAGCTGAG GGCTAGCTACAACGA GAGTGAGG	2160
241	AUUGAAAU G CCUCAACA	742	TGTTGAGG GGCTAGCTACAACGA ATTTCAAT	2161
288	CAAUUUCU G UCUCAUCU	743	AGATGAGA GGCTAGCTACAACGA AGAAATTG	2162
303	CUUAAUAU G UCUCUUGC	744	GCAAGAGA GGCTAGCTACAACGA ATATTAAG	2163
310	UGUCUCUU G CUGAUCUG	745	CAGATCAG GGCTAGCTACAACGA AAGAGACA	2164
318	GCUGAUCU G UAUCAUCG	747	CGATGATA GGCTAGCTACAACGA AGATCAGC	2165
331	AUCGUGAU G CUUCUCUG	749	CAGAGAAG GGCTAGCTACAACGA ATCACGAT	2166
347	GAAGUUCU G CUACAACC	751	GGTTGTAG GGCTAGCTACAACGA AGAACTTC	2167
365	CUAGAUCU G CAGCUUGC	752	GCAAGCTG GGCTAGCTACAACGA AGATCTAG	2168
372	UGCAGCUU G CCACAUCA	753	TGATGTGG GGCTAGCTACAACGA AAGCTGCA	2169
392	UAAAAUCU G UCAUCCCA	754	TGGGATGA GGCTAGCTACAACGA AGATTTTA	2170
402	CAUCCCAU G CAGACAGG	755	CCTGTCTG GGCTAGCTACAACGA ATGGGATG	2171
422	ACAAUAUU G UAUAACAG	756	CTGTTATA GGCTAGCTACAACGA AATATTGT	2172
459	GUUUCUUU G UGAAAAGG	758	CCTTTTCA GGCTAGCTACAACGA AAAGAAAC	2173
492	AACUUAUU G UUACCAUA	760	TATGGTAA GGCTAGCTACAACGA AATAAGTT	2174
502	UACCAUAU G UAUUCAUC	761	GATGAATA GGCTAGCTACAACGA ATATGGTA	2175
512	AUUCAUCU G UUGGAUCU	762	AGATCCAA GGCTAGCTACAACGA AGATGAAT	2176
522	UGGAUCUU G UAAACAUG	763	CATGTTTA GGCTAGCTACAACGA AAGATCCA	2177
570	AAAUAAGU G UAUAAAAU	765	ATTTTATA GGCTAGCTACAACGA ACTTATTT	2178
579	UAUAAAAU G CAACUGUU	766	AACAGTTG GGCTAGCTACAACGA ATTTTATA	2179
585	AUGCAACU G UUGAUUUC	767	GAAATCAA GGCTAGCTACAACGA AGTTGCAT	2180
660	UUAAAACU G CACUGCCA	771	TGGCAGTG GGCTAGCTACAACGA AGTTTTAA	2181
665	ACUGCACU G CCAACAAG	772	CTTGTTGG GGCTAGCTACAACGA AGTGCAGT	2182
736	AUUACAAU G UAAAAGCU	775	AGCTTTTA GGCTAGCTACAACGA ATTGTAAT	2183
807	AAUGAAGU G UCAUUAUU	777	AATAATGA GGCTAGCTACAACGA ACTTCATT	2184
844	UCACAUCU G UUAUCUUA	779	TAAGATAA GGCTAGCTACAACGA AGATGTGA	2185
869	AACUAUUU G UAGUAACU	780	AGTTACTA GGCTAGCTACAACGA AAATAGTT	2186
907	CAGAAAUU G UAUUUUUU	781	AAAAAATA GGCTAGCTACAACGA AATTTCTG	2187
920	UUUUCUAU G CCACAUUA	782	TAATGTGG GGCTAGCTACAACGA ATAGAAAA	2188
1039	UAGUACAU G UAGGUAAA	785	TTTACCTA GGCTAGCTACAACGA ATGTACTA	2189
1058	AUAAAUCU G UUCUAAGA	786	TCTTAGAA GGCTAGCTACAACGA AGATTTAT	2190
1102	GUUAAUAU G UGACAGUG	789	CACTGTCA GGCTAGCTACAACGA ATATTAAC	2191
1168	AAGGCACU G UAGUGAAU	792	ATTCACTA GGCTAGCTACAACGA AGTGCCTT	2192
1253	AUGAUUUU G CAGGUUGU	797	ACAACCTG GGCTAGCTACAACGA AAAATCAT	2193
1260	UGCAGGUU G UCUUCCAU	798	ATGGAAGA GGCTAGCTACAACGA AACCTGCA	2194
1287	CAUCCAAU G CAGGCAAG	799	CTTGCCTG GGCTAGCTACAACGA ATTGGATG	2195
1412	AUGAACUU G UUGGCCCA	804	TGGGCCAA GGCTAGCTACAACGA AAGTTCAT	2196
1484	GUGGGUCC G CAAAAUCU	808	AGATTTTG GGCTAGCTACAACGA GGACCCAC	2197
1564	CAUAUUUU G CGUGUUAU	811	ATAACACG GGCTAGCTACAACGA AAAATATG	2198
1568	UUUUGCGU G UUAUAUGU	812	ACATATAA GGCTAGCTACAACGA ACGCAAAA	2199
1575	UGUUAUAU G UAUUAUAC	813	GTATAATA GGCTAGCTACAACGA ATATAACA	2200
1619	GAGAAAAU G UUAUUUAG	814	CTAAATAA GGCTAGCTACAACGA ATTTTCTC	2201
21	ACUCCCCA G CUAAACAC	815	GTGTTTAG GGCTAGCTACAACGA TGGGGAGT	2202
32	AAACACCC G UAAGACUU	816	AAGTCTTA GGCTAGCTACAACGA GGGTGTTT	2203
76	UGAUCACA G CUGCCAAG	817	CTTGGCAG GGCTAGCTACAACGA TGTGATCA	2204

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85	CUGCCAAG G CUACCUAA	818	TTAGGTAG GGCTAGCTACAACGA CTTGGCAG	2205
103	AGAAGACA G UUAUCUCA	819	TGAGATAA GGCTAGCTACAACGA TGTCTTCT	2206
118	CAUAUUUG G CUGCCAGC	820	GCTGGCAG GGCTAGCTACAACGA CAAATATG	2207
125	GGCUGCCA G CUUUUUAU	821	ATAAAAAG GGCTAGCTACAACGA TGGCAGCC	2208
177	UCCUGCUG G UAUCAUGG	822	CCATGATA GGCTAGCTACAACGA CAGCAGGA	2209
191	UGGAGAAA G UCCAAUAC	823	GTATTGGA GGCTAGCTACAACGA TTTCTCCA	2210
212	CUCGCUCA G CUAUAAGA	824	TCTTATAG GGCTAGCTACAACGA TGAGCGAG	2211
224	UAAGAAGA G CCUCAACC	825	GGTTGAGG GGCTAGCTACAACGA TCTTCTTA	2212
251	CUCAACAA G CACGUCAA	826	TTGACGTG GGCTAGCTACAACGA TTGTTGAG	2213
255	ACAAGCAC G UCAAAAGC	827	GCTTTTGA GGCTAGCTACAACGA GTGCTTGT	2214
262	CGUCAAAA G CUACAGAA	828	TTCTGTAG GGCTAGCTACAACGA TTTTGACG	2215
326	GUAUCAUC G UGAUGCUU	829	AAGCATCA GGCTAGCTACAACGA GATGATAC	2216
342	UCUCUGAA G UUCUGCUA	830	TAGCAGAA GGCTAGCTACAACGA TTCAGAGA	2217
368	GAUCUGCA G CUUGCCAC	831	GTGGCAAG GGCTAGCTACAACGA TGCAGATC	2218
381	CCACAUCA G CUUAAAAU	832	ATTTTAAG GGCTAGCTACAACGA TGATGTGG	2219
443	CUUCCUGA G UAGAAGAG	833	CTCTTCTA GGCTAGCTACAACGA TCAGGAAG	2220
451	GUAGAAGA G UUUCUUUG	834	CAAAGAAA GGCTAGCTACAACGA TCTTCTAC	2221
467	GUGAAAAG G UCAAGAUU	835	AATCTTGA GGCTAGCTACAACGA CTTTTCAC	2222
537	UGAAAAGG G CUUUAUUU	836	AAATAAAG GGCTAGCTACAACGA CCTTTTCA	2223
568	CAAAAUAA G UGUAUAAA	837	TTTATACA GGCTAGCTACAACGA TTATTTTG	2224
603	UCAACAUG G CUCACAAA	838	TTTGTGAG GGCTAGCTACAACGA CATGTTGA	2225
644	GAUGAAGA G UUUAGUUU	839	AAACTAAA GGCTAGCTACAACGA TCTTCATC	2226
649	AGAGUUUA G UUUUAAAA	840	TTTTAAAA GGCTAGCTACAACGA TAAACTCT	2227
673	GCCAACAA G UUCACUUC	841	GAAGTGAA GGCTAGCTACAACGA TTGTTGGC	2228
691	UAUAUAAA G CAUUAUUU	842	AAATAATG GGCTAGCTACAACGA TTTATATA	2229
713	CUUUUGAG G UGAAUAUA	843	TATATTCA GGCTAGCTACAACGA CTCAAAAG	2230
742	AUGUAAAA G CUUCUUUA	844	TAAAGAAG GGCTAGCTACAACGA TTTTACAT	2231
758	AAUACUAA G UAUUUUUC	845	GAAAAATA GGCTAGCTACAACGA TTAGTATT	2232
769	UUUUUCAG G UCUUCACC	846	GGTGAAGA GGCTAGCTACAACGA CTGAAAAA	2233
780	UUCACCAA G UAUCAAAG	847	CTTTGATA GGCTAGCTACAACGA TTGGTGAA	2234
788	GUAUCAAA G UAAUAACA	848	TGTTATTA GGCTAGCTACAACGA TTTGATAC	2235
805	CAAAUGAA G UGUCAUUA	849	TAATGACA GGCTAGCTACAACGA TTCATTTG	2236
823	UCAAAAUA G UCCACUGA	850	TCAGTGGA GGCTAGCTACAACGA TATTTTGA	2237
872	UAUUUGUA G UAACUAUC	851	GATAGTTA GGCTAGCTACAACGA TACAAATA	2238
941	CUUUUAAA G UUGAUGAG	852	CTCATCAA GGCTAGCTACAACGA TTTAAAAG	2239
956	AGAAUCAA G UAUGGAAA	853	TTTCCATA GGCTAGCTACAACGA TTGATTCT	2240
966	AUGGAAAA G UAAGGCCA	854	TGGCCTTA GGCTAGCTACAACGA TTTTCCAT	2241
971	AAAGUAAG G CCAUACUC	855	GAGTATGG GGCTAGCTACAACGA CTTACTTT	2242
1003	CCUUUUAA G UAAUUUUU	856	AAAAATTA GGCTAGCTACAACGA TTAAAAGG	2243
1033	GAAUUCUA G UACAUGUA	857	TACATGTA GGCTAGCTACAACGA TAGAATTC	2244
1043	ACAUGUAG G UAAAUCAU	858	ATGATTTA GGCTAGCTACAACGA CTACATGT	2245
1091	GAGAACUG G UGGUUAAU	859	ATTAACCA GGCTAGCTACAACGA CAGTTCTC	2246
1094	AACUGGUG G UUAAUAUG	860	CATATTAA GGCTAGCTACAACGA CACCAGTT	2247
1108	AUGUGACA G UGAGAUUA	861	TAATCTCA GGCTAGCTACAACGA TGTCACAT	2248
1117	UGAGAUUA G UCAUAUCA	862	TGATATGA GGCTAGCTACAACGA TAATCTCA	2249
1163	CAUUUAAG G CACUGUAG	863	CTACAGTG GGCTAGCTACAACGA CTTAAATG	2250
1171	GCACUGUA G UGAAUUAU	864	ATAATTCA GGCTAGCTACAACGA TACAGTGC	2251

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1184	UUAUCUGA G CUAGAGUU	865	AACTCTAG GGCTAGCTACAACGA TCAGATAA	2252
1190	GAGCUAGA G UUACCUAG	866	CTAGGTAA GGCTAGCTACAACGA TCTAGCTC	2253
1198	GUUACCUA G CUUACCAU	867	ATGGTAAG GGCTAGCTACAACGA TAGGTAAC	2254
1257	UUUUGCAG G UUGUCUUC	868	GAAGACAA GGCTAGCTACAACGA CTGCAAAA	2255
1273	CCAUUCCA G CCUAACAU	869	ATGTTAGG GGCTAGCTACAACGA TGGAATGG	2256
1291	CAAUGCAG G CAAGGAAA	870	TTTCCTTG GGCTAGCTACAACGA CTGCATTG	2257
1314	GAUUUCCA G UGACAGAA	871	TTCTGTCA GGCTAGCTACAACGA TGGAAATC	2258
1339	UAUCUCAA G UAUUUUUU	872	AAAAAATA GGCTAGCTACAACGA TTGAGATA	2259
1416	ACUUGUUG G CCCAUCUA	873	TAGATGGG GGCTAGCTACAACGA CAACAAGT	2260
1436	CAUCUACA G CUGACCCU	874	AGGGTCAG GGCTAGCTACAACGA TGTAGATG	2261
1456	ACAUGGGG G UUAGGGGA	875	TCCCCTAA GGCTAGCTACAACGA CCCCATGT	2262
1465	UUAGGGGA G CUGACAAU	876	ATTGTCAG GGCTAGCTACAACGA TCCCCTAA	2263
1476	GACAAUUC G UGGGUCCG	877	CGGACCCA GGCTAGCTACAACGA GAATTGTC	2264
1480	AUUCGUGG G UCCGCAAA	878	TTTGCGGA GGCTAGCTACAACGA CCACGAAT	2265
1506	ACCUAAUA G CCUACUAU	879	ATAGTAGG GGCTAGCTACAACGA TATTAGGT	2266
1545	CAUAAACA G UAAAUUAA	880	TTAATTTA GGCTAGCTACAACGA TGTTTATG	2267
1566	UAUUUUGC G UGUUAUAU	881	ATATAACA GGCTAGCTACAACGA GCAAAATA	2268
1603	ACAAUAAA G UAAGCUAG	882	CTAGCTTA GGCTAGCTACAACGA TTTATTGT	2269
1607	UAAAGUAA G CUAGAGAA	883	TTCTCTAG GGCTAGCTACAACGA TTACTTTA	2270
13	GUCAGAAA A CUCCCCAG	884	CTGGGGAG GGCTAGCTACAACGA TTTCTGAC	2271
26	CCAGCUAA A CACCCGUA	885	TACGGGTG GGCTAGCTACAACGA TTAGCTGG	2272
28	AGCUAAAC A CCCGUAAG	886	CTTACGGG GGCTAGCTACAACGA GTTTAGCT	2273
37	CCCGUAAG A CUUCAUAC	887	GTATGAAG GGCTAGCTACAACGA CTTACGGG	2274
42	AAGACUUC A UACAACAC	888	GTGTTGTA GGCTAGCTACAACGA GAAGTCTT	2275
47	UUCAUACA A CACAAUAC	889	GTATTGTG GGCTAGCTACAACGA TGTATGAA	2276
49	CAUACAAC A CAAUACUC	890	GAGTATTG GGCTAGCTACAACGA GTTGTATG	2277
52	ACAACACA A UACUCUAU	891	ATAGAGTA GGCTAGCTACAACGA TGTGTTGT	2278
67	AUACUGUG A UGAUCACA	892	TGTGATCA GGCTAGCTACAACGA CACAGTAT	2279
70	CUGUGAUG A UCACAGCU	893	AGCTGTGA GGCTAGCTACAACGA CATCACAG	2280
73	UGAUGAUC A CAGCUGCC	894	GGCAGCTG GGCTAGCTACAACGA GATCATCA	2281
100	AAAAGAAG A CAGUUAUC	895	GATAACTG GGCTAGCTACAACGA CTTCTTTT	2282
111	GUUAUCUC A UAUUUGGC	896	GCCAAATA GGCTAGCTACAACGA GAGATAAC	2283
144	UUCUCUCG A CCACUUAA	897	TTAAGTGG GGCTAGCTACAACGA CGAGAGAA	2284
147	UCUCGACC A CUUAAAAC	898	GTTTTAAG GGCTAGCTACAACGA GGTCGAGA	2285
154	CACUUAAA A CUUCAGAC	899	GTCTGAAG GGCTAGCTACAACGA TTTAAGTG	2286
161	AACUUCAG A CUUCCUGU	900	ACAGGAAG GGCTAGCTACAACGA CTGAAGTT	2287
182	CUGGUAUC A UGGAGAAA	901	TTTCTCCA GGCTAGCTACAACGA GATACCAG	2288
196	AAAGUCCA A UACCUCAC	902	GTGAGGTA GGCTAGCTACAACGA TGGACTTT	2289
203	AAUACCUC A CUCGCUCA	903	TGAGCGAG GGCTAGCTACAACGA GAGGTATT	2290
230	GAGCCUCA A CCAUUGAA	904	TTCAATGG GGCTAGCTACAACGA TGAGGCTC	2291
233	CCUCAACC A UUGAAAUG	905	CATTTCAA GGCTAGCTACAACGA GGTTGAGG	2292
239	CCAUUGAA A UGCCUCAA	906	TTGAGGCA GGCTAGCTACAACGA TTCAATGG	2293
247	AUGCCUCA A CAAGCACG	907	CGTGCTTG GGCTAGCTACAACGA TGAGGCAT	2294
253	CAACAAGC A CGUCAAAA	908	TTTTGACG GGCTAGCTACAACGA GCTTGTTG	2295
270	GCUACAGA A UCUAUUUA	909	TAAATAGA GGCTAGCTACAACGA TCTGTAGC	2296
282	AUUUAUCA A UUUCUGUC	910	GACAGAAA GGCTAGCTACAACGA TGATAAAT	2297
293	UCUGUCUC A UCUUAAUA	911	TATTAAGA GGCTAGCTACAACGA GAGACAGA	2298

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299	UCAUCUUA A UAUGUCUC	912	GAGACATA GGCTAGCTACAACGA TAAGATGA	2299
314	UCUUGCUG A UCUGUAUC	913	GATACAGA GGCTAGCTACAACGA CAGCAAGA	2300
323	UCUGUAUC A UCGUGAUG	914	CATCACGA GGCTAGCTACAACGA GATACAGA	2301
329	UCAUCGUG A UGCUUCUC	915	GAGAAGCA GGCTAGCTACAACGA CACGATGA	2302
353	CUGCUACA A CCUCUAGA	916	TCTAGAGG GGCTAGCTACAACGA TGTAGCAG	2303
361	ACCUCUAG A UCUGCAGC	917	GCTGCAGA GGCTAGCTACAACGA CTAGAGGT	2304
375	AGCUUGCC A CAUCAGCU	918	AGCTGATG GGCTAGCTACAACGA GGCAAGCT	2305
377	CUUGCCAC A UCAGCUUA	919	TAAGCTGA GGCTAGCTACAACGA GTGGCAAG	2306
388	AGCUUAAA A UCUGUCAU	920	ATGACAGA GGCTAGCTACAACGA TTTAAGCT	2307
395	AAUCUGUC A UCCCAUGC	921	GCATGGGA GGCTAGCTACAACGA GACAGATT	2308
400	GUCAUCCC A UGCAGACA	922	TGTCTGCA GGCTAGCTACAACGA GGGATGAC	2309
406	CCAUGCAG A CAGGAAAA	923	TTTTCCTG GGCTAGCTACAACGA CTGCATGG	2310
414	ACAGGAAA A CAAUAUUG	924	CAATATTG GGCTAGCTACAACGA TTTCCTGT	2311
417	GGAAAACA A UAUUGUAU	925	ATACAATA GGCTAGCTACAACGA TGTTTTCC	2312
427	AUUGUAUA A CAGACCAC	926	GTGGTCTG GGCTAGCTACAACGA TATACAAT	2313
431	UAUAACAG A CCACUUCC	927	GGAAGTGG GGCTAGCTACAACGA CTGTTATA	2314
434	AACAGACC A CUUCCUGA	928	TCAGGAAG GGCTAGCTACAACGA GGTCTGTT	2315
473	AGGUCAAG A UUAAGACU	929	AGTCTTAA GGCTAGCTACAACGA CTTGACCT	2316
479	AGAUUAAG A CUAAAACU	930	AGTTTTAG GGCTAGCTACAACGA CTTAATCT	2317
485	AGACUAAA A CUUAUUGU	931	ACAATAAG GGCTAGCTACAACGA TTTAGTCT	2318
498	UUGUUACC A UAUGUAUU	932	AATACATA GGCTAGCTACAACGA GGTAACAA	2319
508	AUGUAUUC A UCUGUUGG	933	CCAACAGA GGCTAGCTACAACGA GAATACAT	2320
517	UCUGUUGG A UCUUGUAA	934	TTACAAGA GGCTAGCTACAACGA CCAACAGA	2321
526	UCUUGUAA A CAUGAAAA	935	TTTTCATG GGCTAGCTACAACGA TTACAAGA	2322
528	UUGUAAAC A UGAAAAGG	936	CCTTTTCA GGCTAGCTACAACGA GTTTACAA	2323
552	UUUCAAAA A UUAACUUC	937	GAAGTTAA GGCTAGCTACAACGA TTTTGAAA	2324
556	AAAAAUUA A CUUCAAAA	938	TTTTGAAG GGCTAGCTACAACGA TAATTTTT	2325
564	ACUUCAAA A UAAGUGUA	939	TACACTTA GGCTAGCTACAACGA TTTGAAGT	2326
577	UGUAUAAA A UGCAACUG	940	CAGTTGCA GGCTAGCTACAACGA TTTATACA	2327
582	AAAAUGCA A CUGUUGAU	941	ATCAACAG GGCTAGCTACAACGA TGCATTTT	2328
589	AACUGUUG A UUUCCUCA	942	TGAGGAAA GGCTAGCTACAACGA CAACAGTT	2329
598	UUUCCUCA A CAUGGCUC	943	GAGCCATG GGCTAGCTACAACGA TGAGGAAA	2330
600	UCCUCAAC A UGGCUCAC	944	GTGAGCCA GGCTAGCTACAACGA GTTGAGGA	2331
607	CAUGGCUC A CAAAUUUC	945	GAAATTTG GGCTAGCTACAACGA GAGCCATG	2332
611	GCUCACAA A UUUCUAUC	946	GATAGAAA GGCTAGCTACAACGA TTGTGAGC	2333
624	UAUCCCAA A UCUUUUCU	947	AGAAAAGA GGCTAGCTACAACGA TTGGGATA	2334
637	UUCUGAAG A UGAAGAGU	948	ACTCTTCA GGCTAGCTACAACGA CTTCAGAA	2335
657	GUUUUAAA A CUGCACUG	949	CAGTGCAG GGCTAGCTACAACGA TTTAAAAC	2336
662	AAAACUGC A CUGCCAAC	950	GTTGGCAG GGCTAGCTACAACGA GCAGTTTT	2337
669	CACUGCCA A CAAGUUCA	951	TGAACTTG GGCTAGCTACAACGA TGGCAGTG	2338
677	ACAAGUUC A CUUCAUAU	952	ATATGAAG GGCTAGCTACAACGA GAACTTGT	2339
682	UUCACUUC A UAUAUAAA	953	TTTATATA GGCTAGCTACAACGA GAAGTGAA	2340
693	UAUAAAGC A UUAUUUUU	954	AAAAATAA GGCTAGCTACAACGA GCTTTATA	2341
717	UGAGGUGA A UAUAAUUU	955	AAATTATA GGCTAGCTACAACGA TCACCTCA	2342
722	UGAAUAUA A UUUAUAUU	956	AATATAAA GGCTAGCTACAACGA TATATTCA	2343
734	AUAUUACA A UGUAAAAG	957	CTTTTACA GGCTAGCTACAACGA TGTAATAT	2344
751	CUUCUUUA A UACUAAGU	958	ACTTAGTA GGCTAGCTACAACGA TAAAGAAG	2345

Table 28

775	AGGUCUUC A CCAAGUAU	959	ATACTTGG GGCTAGCTACAACGA GAAGACCT	2346
791	UCAAAGUA A UAACACAA	960	TTGTGTTA GGCTAGCTACAACGA TACTTTGA	2347
794	AAGUAAUA A CACAAAUG	961	CATTTGTG GGCTAGCTACAACGA TATTACTT	2348
796	GUAAUAAC A CAAAUGAA	962	TTCATTTG GGCTAGCTACAACGA GTTATTAC	2349
800	UAACACAA A UGAAGUGU	963	ACACTTCA GGCTAGCTACAACGA TTGTGTTA	2350
810	GAAGUGUC A UUAUUCAA	964	TTGAATAA GGCTAGCTACAACGA GACACTTC	2351
820	UAUUCAAA A UAGUCCAC	965	GTGGACTA GGCTAGCTACAACGA TTTGAATA	2352
827	AAUAGUCC A CUGACUCC	966	GGAGTCAG GGCTAGCTACAACGA GGACTATT	2353
831	GUCCACUG A CUCCUCAC	967	GTGAGGAG GGCTAGCTACAACGA CAGTGGAC	2354
838	GACUCCUC A CAUCUGUU	968	AACAGATG GGCTAGCTACAACGA GAGGAGTC	2355
840	CUCCUCAC A UCUGUUAU	969	ATAACAGA GGCTAGCTACAACGA GTGAGGAG	2356
862	UAUAAAGA A CUAUUUGU	970	ACAAATAG GGCTAGCTACAACGA TCTTTATA	2357
875	UUGUAGUA A CUAUCAGA	971	TCTGATAG GGCTAGCTACAACGA TACTACAA	2358
884	CUAUCAGA A UCUACAUU	972	AATGTAGA GGCTAGCTACAACGA TCTGATAG	2359
890	GAAUCUAC A UUCUAAAA	973	TTTTAGAA GGCTAGCTACAACGA GTAGATTC	2360
898	AUUCUAAA A CAGAAAUU	974	AATTTCTG GGCTAGCTACAACGA TTTAGAAT	2361
904	AAACAGAA A UUGUAUUU	975	AAATACAA GGCTAGCTACAACGA TTCTGTTT	2362
923	UCUAUGCC A CAUUAACA	976	TGTTAATG GGCTAGCTACAACGA GGCATAGA	2363
925	UAUGCCAC A UUAACAUC	977	GATGTTAA GGCTAGCTACAACGA GTGGCATA	2364
929	CCACAUUA A CAUCUUUU	978	AAAAGATG GGCTAGCTACAACGA TAATGTGG	2365
931	ACAUUAAC A UCUUUUAA	979	TTAAAAGA GGCTAGCTACAACGA GTTAATGT	2366
945	UAAAGUUG A UGAGAAUC	980	GATTCTCA GGCTAGCTACAACGA CAACTTTA	2367
951	UGAUGAGA A UCAAGUAU	981	ATACTTGA GGCTAGCTACAACGA TCTCATCA	2368
974	GUAAGGCC A UACUCUUA	982	TAAGAGTA GGCTAGCTACAACGA GGCCTTAC	2369
984	ACUCUUAC A UAAUAAAA	983	TTTTATTA GGCTAGCTACAACGA GTAAGAGT	2370
987	CUUACAUA A UAAAAUUC	984	GAATTTTA GGCTAGCTACAACGA TATGTAAG	2371
992	AUAAUAAA A UUCCUUUU	985	AAAAGGAA GGCTAGCTACAACGA TTTATTAT	2372
1006	UUUAAGUA A UUUUUUCA	986	TGAAAAAA GGCTAGCTACAACGA TACTTAAA	2373
1019	UUCAAAGA A UCACAGAA	987	TTCTGTGA GGCTAGCTACAACGA TCTTTGAA	2374
1022	AAAGAAUC A CAGAAUUC	988	GAATTCTG GGCTAGCTACAACGA GATTCTTT	2375
1027	AUCACAGA A UUCUAGUA	989	TACTAGAA GGCTAGCTACAACGA TCTGTGAT	2376
1037	UCUAGUAC A UGUAGGUA	990	TACCTACA GGCTAGCTACAACGA GTACTAGA	2377
1047	GUAGGUAA A UCAUAAAU	991	ATTTATGA GGCTAGCTACAACGA TTACCTAC	2378
1050	GGUAAAUC A UAAAUCUG	992	CAGATTTA GGCTAGCTACAACGA GATTTACC	2379
1054	AAUCAUAA A UCUGUUCU	993	AGAACAGA GGCTAGCTACAACGA TTATGATT	2380
1066	GUUCUAAG A CAUAUGAU	994	ATCATATG GGCTAGCTACAACGA CTTAGAAC	2381
1068	UCUAAGAC A UAUGAUCA	995	TGATCATA GGCTAGCTACAACGA GTCTTAGA	2382
1073	GACAUAUG A UCAACAGA	996	TCTGTTGA GGCTAGCTACAACGA CATATGTC	2383
1077	UAUGAUCA A CAGAUGAG	997	CTCATCTG GGCTAGCTACAACGA TGATCATA	2384
1081	AUCAACAG A UGAGAACU	998	AGTTCTCA GGCTAGCTACAACGA CTGTTGAT	2385
1087	AGAUGAGA A CUGGUGGU	999	ACCACCAG GGCTAGCTACAACGA TCTCATCT	2386
1098	GGUGGUUA A UAUGUGAC	1000	GTCACATA GGCTAGCTACAACGA TAACCACC	2387
1105	AAUAUGUG A CAGUGAGA	1001	TCTCACTG GGCTAGCTACAACGA CACATATT	2388
1113	ACAGUGAG A UUAGUCAU	1002	ATGACTAA GGCTAGCTACAACGA CTCACTGT	2389
1120	GAUUAGUC A UAUCACUA	1003	TAGTGATA GGCTAGCTACAACGA GACTAATC	2390
1125	GUCAUAUC A CUAAUAUA	1004	TATATTAG GGCTAGCTACAACGA GATATGAC	2391
1129	UAUCACUA A UAUACUAA	1005	TTAGTATA GGCTAGCTACAACGA TAGTGATA	2392

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1137	AUAUACUA A CAACAGAA	1006	TTCTGTTG GGCTAGCTACAACGA TAGTATAT	2393
1140	UACUAACA A CAGAAUCU	1007	AGATTCTG GGCTAGCTACAACGA TGTTAGTA	2394
1145	ACAACAGA A UCUAAUCU	1008	AGATTAGA GGCTAGCTACAACGA TCTGTTGT	2395
1150	AGAAUCUA A UCUUCAUU	1009	AATGAAGA GGCTAGCTACAACGA TAGATTCT	2396
1156	UAAUCUUC A UUUAAGGC	1010	GCCTTAAA GGCTAGCTACAACGA GAAGATTA	2397
1165	UUUAAGGC A CUGUAGUG	1011	CACTACAG GGCTAGCTACAACGA GCCTTAAA	2398
1175	UGUAGUGA A UUAUCUGA	1012	TCAGATAA GGCTAGCTACAACGA TCACTACA	2399
1205	AGCUUACC A UACUAUAU	1013	ATATAGTA GGCTAGCTACAACGA GGTAAGCT	2400
1221	UCUUUGGA A UCAUGAAA	1014	TTTCATGA GGCTAGCTACAACGA TCCAAAGA	2401
1224	UUGGAAUC A UGAAACCU	1015	AGGTTTCA GGCTAGCTACAACGA GATTCCAA	2402
1229	AUCAUGAA A CCUUAAGA	1016	TCTTAAGG GGCTAGCTACAACGA TTCATGAT	2403
1237	ACCUUAAG A CUUCAGAA	1017	TTCTGAAG GGCTAGCTACAACGA CTTAAGGT	2404
1245	ACUUCAGA A UGAUUUUG	1018	CAAAATCA GGCTAGCTACAACGA TCTGAAGT	2405
1248	UCAGAAUG A UUUUGCAG	1019	CTGCAAAA GGCTAGCTACAACGA CATTCTGA	2406
1267	UGUCUUCC A UUCCAGCC	1020	GGCTGGAA GGCTAGCTACAACGA GGAAGACA	2407
1278	CCAGCCUA A CAUCCAAU	1021	ATTGGATG GGCTAGCTACAACGA TAGGCTGG	2408
1280	AGCCUAAC A UCCAAUGC	1022	GCATTGGA GGCTAGCTACAACGA GTTAGGCT	2409
1285	AACAUCCA A UGCAGGCA	1023	TGCCTGCA GGCTAGCTACAACGA TGGATGTT	2410
1300	CAAGGAAA A UAAAAGAU	1024	ATCTTTTA GGCTAGCTACAACGA TTTCCTTG	2411
1307	AAUAAAAG A UUUCCAGU	1025	ACTGGAAA GGCTAGCTACAACGA CTTTTATT	2412
1317	UUCCAGUG A CAGAAAAA	1026	TTTTTCTG GGCTAGCTACAACGA CACTGGAA	2413
1325	ACAGAAAA A UAUAUUAU	1027	ATAATATA GGCTAGCTACAACGA TTTTCTGT	2414
1352	UUUUAAAA A UAUAUGAA	1028	TTCATATA GGCTAGCTACAACGA TTTTAAAA	2415
1360	AUAUAUGA A UUCUCUCU	1029	AGAGAGAA GGCTAGCTACAACGA TCATATAT	2416
1373	CUCUCCAA A UAUUAACU	1030	AGTTAATA GGCTAGCTACAACGA TTGGAGAG	2417
1379	AAAUAUUA A CUAAUUAU	1031	ATAATTAG GGCTAGCTACAACGA TAATATTT	2418
1383	AUUAACUA A UUAUUAGA	1032	TCTAATAA GGCTAGCTACAACGA TAGTTAAT	2419
1391	AUUAUUAG A UUAUAUUU	1033	AAATATAA GGCTAGCTACAACGA CTAATAAT	2420
1404	AUUUUGAA A UGAACUUG	1034	CAAGTTCA GGCTAGCTACAACGA TTCAAAAT	2421
1408	UGAAAUGA A CUUGUUGG	1035	CCAACAAG GGCTAGCTACAACGA TCATTTCA	2422
1420	GUUGGCCC A UCUAUUAC	1036	GTAATAGA GGCTAGCTACAACGA GGGCCAAC	2423
1429	UCUAUUAC A UCUACAGC	1037	GCTGTAGA GGCTAGCTACAACGA GTAATAGA	2424
1440	UACAGCUG A CCCUUGAA	1038	TTCAAGGG GGCTAGCTACAACGA CAGCTGTA	2425
1448	ACCCUUGA A CAUGGGGG	1039	CCCCCATG GGCTAGCTACAACGA TCAAGGGT	2426
1450	CCUUGAAC A UGGGGGUU	1040	AACCCCCA GGCTAGCTACAACGA GTTCAAGG	2427
1469	GGGAGCUG A CAAUUCGU	1041	ACGAATTG GGCTAGCTACAACGA CAGCTCCC	2428
1472	AGCUGACA A UUCGUGGG	1042	CCCACGAA GGCTAGCTACAACGA TGTCAGCT	2429
1489	UCCGCAAA A UCUUAACU	1043	AGTTAAGA GGCTAGCTACAACGA TTTGCGGA	2430
1495	AAAUCUUA A CUACCUAA	1044	TTAGGTAG GGCTAGCTACAACGA TAAGATTT	2431
1503	ACUACCUA A UAGCCUAC	1045	GTAGGCTA GGCTAGCTACAACGA TAGGTAGT	2432
1517	UACUAUUG A CCAUAAAC	1046	GTTTATGG GGCTAGCTACAACGA CAATAGTA	2433
1520	UAUUGACC A UAAACCUU	1047	AAGGTTTA GGCTAGCTACAACGA GGTCAATA	2434
1524	GACCAUAA A CCUUACUG	1048	CAGTAAGG GGCTAGCTACAACGA TTATGGTC	2435
1533	CCUUACUG A UAACAUAA	1049	TTATGTTA GGCTAGCTACAACGA CAGTAAGG	2436
1536	UACUGAUA A CAUAAACA	1050	TGTTTATG GGCTAGCTACAACGA TATCAGTA	2437
1538	CUGAUAAC A UAAACAGU	1051	ACTGTTTA GGCTAGCTACAACGA GTTATCAG	2438
1542	UAACAUAA A CAGUAAAU	1052	ATTTACTG GGCTAGCTACAACGA TTATGTTA	2439

Table 28

1549	AACAGUAA A UUAACACA	1053	TGTGTTAA GGCTAGCTACAACGA TTACTGTT	2440
1553	GUAAAUUA A CACAUAUU	1054	AATATGTG GGCTAGCTACAACGA TAATTTAC	2441
1555	AAAUUAAC A CAUAUUUU	1055	AAAATATG GGCTAGCTACAACGA GTTAATTT	2442
1557	AUUAACAC A UAUUUUGC	1056	GCAAAATA GGCTAGCTACAACGA GTGTTAAT	2443
1584	UAUUAUAC A CUAUAUUC	1057	GAATATAG GGCTAGCTACAACGA GTATAATA	2444
1598	UUCCUACA A UAAAGUAA	1058	TTACTTTA GGCTAGCTACAACGA TGTAGGAA	2445
1617	UAGAGAAA A UGUUAUUU	1059	AAATAACA GGCTAGCTACAACGA TTTCTCTA	2446

Input Sequence = PLN. Cut Site = R/Y
Stem Length = 8 . Core Sequence = GGCTAGCTACAACGA
PLN (Homo sapiens phospholamban (PLN) mRNA.; 1635 bp)

Table 29

Table 29: Human Phospholamban (PLN) amberzyme Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
64	UCUAUACU G UGAUGAUC	732	GAUCAUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUAUAGA	2447
66	UAUACUGU G AUGAUCAC	733	GUGAUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGUAUA	2448
69	ACUGUGAU G AUCACAGC	734	GCUGUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCACAGU	2449
79	UCACAGCU G CCAAGGCU	735	AGCCUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUGUGA	2450
121	AUUUGGCU G CCAGCUUU	736	AAAGCUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCAAAU	2451
143	UUUCUCUC G ACCACUUA	737	UAAGUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGAGAAA	2452
168	GACUUCCU G UCCUGCUG	738	CAGCAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAAGUC	2453
173	CCUGUCCU G CUGGUAUC	739	GAUACCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGACAGG	2454
207	CCUCACUC G CUCAGCUA	740	UAGCUGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGUGAGG	2455
236	CAACCAUU G AAAUGCCU	741	AGGCAUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGGUUG	2456
241	AUUGAAAU G CCUCAACA	742	UGUUGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUCAAU	2457
288	CAAUUUCU G UCUCAUCU	743	AGAUGAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAAUUG	2458
303	CUUAAUAU G UCUCUUGC	744	GCAAGAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUUAAG	2459
310	UGUCUCUU G CUGAUCUG	745	CAGAUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAGACA	2460
313	CUCUUGCU G AUCUGUAU	746	AUACAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAAGAG	2461
318	GCUGAUCU G UAUCAUCG	747	CGAUGAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUCAGC	2462
328	AUCAUCGU G AUGCUUCU	748	AGAAGCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGAUGAU	2463
331	AUCGUGAU G CUUCUCUG	749	CAGAGAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCACGAU	2464
339	GCUUCUCU G AAGUUCUG	750	CAGAACUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGAAGC	2465
347	GAAGUUCU G CUACAACC	751	GGUUGUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAACUUC	2466
365	CUAGAUCU G CAGCUUGC	752	GCAAGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUCUAG	2467
372	UGCAGCUU G CCACAUCA	753	UGAUGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGCUGCA	2468
392	UAAAAUCU G UCAUCCCA	754	UGGGAUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUUUUA	2469
402	CAUCCCAU G CAGACAGG	755	CCUGUCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGGAUG	2470
422	ACAAUAUU G UAUAACAG	756	CUGUUAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUAUUGU	2471
441	CACUUCCU G AGUAGAAG	757	CUUCUACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAAGUG	2472
459	GUUUCUUU G UGAAAAGG	758	CCUUUUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGAAAC	2473
461	UUCUUUGU G AAAAGGUC	759	GACCUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAAGAA	2474

Table 29

492	AACUUAUU G UUACCAUA	760	UAUGGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUAAGUU	2475
502	UACCAUAU G UAUUCAUC	761	GAUGAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUGGUA	2476
512	AUUCAUCU G UUGGAUCU	762	AGAUCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUGAAU	2477
522	UGGAUCUU G UAAACAUG	763	CAUGUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAUCCA	2478
530	GUAAACAU G AAAAGGGC	764	GCCCUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGUUUAC	2479
570	AAAUAAGU G UAUAAAAU	765	AUUUUAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUUAUUU	2480
579	UAUAAAAU G CAACUGUU	766	AACAGUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUUAUA	2481
585	AUGCAACU G UUGAUUUC	767	GAAAUCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUGCAU	2482
588	CAACUGUU G AUUUCCUC	768	GAGGAAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAGUUG	2483
633	UCUUUUCU G AAGAUGAA	769	UUCAUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAAAGA	2484
639	CUGAAGAU G AAGAGUUU	770	AAACUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUUCAG	2485
660	UUAAAACU G CACUGCCA	771	UGGCAGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUUUAA	2486
665	ACUGCACU G CCAACAAG	772	CUUGUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGCAGU	2487
710	ACUCUUUU G AGGUGAAU	773	AUUCACCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAGAGU	2488
715	UUUGAGGU G AAUAUAAU	774	AUUAUAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCUCAAA	2489
736	AUUACAAU G UAAAAGCU	775	AGCUUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUGUAAU	2490
802	ACACAAAU G AAGUGUCA	776	UGACACUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUGUGU	2491
807	AAUGAAGU G UCAUUAUU	777	AAUAAUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUUCAUU	2492
830	AGUCCACU G ACUCCUCA	778	UGAGGAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGGACU	2493
844	UCACAUCU G UUAUCUUA	779	UAAGAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUGUGA	2494
869	AACUAUUU G UAGUAACU	780	AGUUACUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUAGUU	2495
907	CAGAAAUU G UAUUUUUU	781	AAAAAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUUUCUG	2496
920	UUUUCUAU G CCACAUUA	782	UAAUGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGAAAA	2497
944	UUAAAGUU G AUGAGAAU	783	AUUCUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACUUUAA	2498
947	AAGUUGAU G AGAAUCAA	784	UUGAUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAACUU	2499
1039	UAGUACAU G UAGGUAAA	785	UUUACCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGUACUA	2500
1058	AUAAAUCU G UUCUAAGA	786	UCUUAGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUUUAU	2501
1072	AGACAUAU G AUCAACAG	787	CUGUUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUGUCU	2502
1083	CAACAGAU G AGAACUGG	788	CCAGUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUGUUG	2503
1102	GUUAAUAU G UGACAGUG	789	CACUGUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUUAAC	2504
1104	UAAUAUGU G ACAGUGAG	790	CUCACUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUAUUA	2505

Table 29

1110	GUGACAGU G AGAUUAGU	791	ACUAAUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGUCAC	2506
1168	AAGGCACU G UAGUGAAU	792	AUUCACUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGCCUU	2507
1173	ACUGUAGU G AAUUAUCU	793	AGAUAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUACAGU	2508
1182	AAUUAUCU G AGCUAGAG	794	CUCUAGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUAAUU	2509
1226	GGAAUCAU G AAACCUUA	795	UAAGGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAUUCC	2510
1247	UUCAGAAU G AUUUUGCA	796	UGCAAAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUCUGAA	2511
1253	AUGAUUUU G CAGGUUGU	797	ACAACCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAUCAU	2512
1260	UGCAGGUU G UCUUCCAU	798	AUGGAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACCUGCA	2513
1287	CAUCCAAU G CAGGCAAG	799	CUUGCCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUGGAUG	2514
1316	UUUCCAGU G ACAGAAAA	800	UUUUCUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGGAAA	2515
1358	AAAUAUAU G AAUUCUCU	801	AGAGAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUAUUU	2516
1401	UAUAUUUU G AAAUGAAC	802	GUUCAUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAUAUA	2517
1406	UUUGAAAU G AACUUGUU	803	AACAAGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUCAAA	2518
1412	AUGAACUU G UUGGCCCA	804	UGGGCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGUUCAU	2519
1439	CUACAGCU G ACCCUUGA	805	UCAAGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUGUAG	2520
1446	UGACCCUU G AACAUGGG	806	CCCAUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGGUCA	2521
1468	GGGGAGCU G ACAAUUCG	807	CGAAUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUCCCC	2522
1484	GUGGGUCC G CAAAAUCU	808	AGAUUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGACCCAC	2523
1516	CUACUAUU G ACCAUAAA	809	UUUAUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUAGUAG	2524
1532	ACCUUACU G AUAACAUA	810	UAUGUUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUAAGGU	2525
1564	CAUAUUUU G CGUGUUAU	811	AUAACACG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAUAUG	2526
1568	UUUUGCGU G UUAUAUGU	812	ACAUAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGCAAAA	2527
1575	UGUUAUAU G UAUUAUAC	813	GUAUAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUAACA	2528
1619	GAGAAAAU G UUAUUUAG	814	CUAAAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUUCUC	2529
21	ACUCCCCA G CUAAACAC	815	GUGUUUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGGAGU	2530
32	AAACACCC G UAAGACUU	816	AAGUCUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGUGUUU	2531
76	UGAUCACA G CUGCCAAG	817	CUUGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGAUCA	2532
85	CUGCCAAG G CUACCUAA	818	UUAGGUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGGCAG	2533
103	AGAAGACA G UUAUCUCA	819	UGAGAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCUUCU	2534
118	CAUAUUUG G CUGCCAGC	820	GCUGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAUAUG	2535
125	GGCUGCCA G CUUUUUAU	821	AUAAAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCAGCC	2536

Table 29

177	UCCUGCUG G UAUCAUGG	822	CCAUGAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCAGGA	2537
191	UGGAGAAA G UCCAAUAC	823	GUAUUGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUCUCCA	2538
212	CUCGCUCA G CUAUAAGA	824	UCUUAUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGCGAG	2539
224	UAAGAAGA G CCUCAACC	825	GGUUGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUCUUA	2540
251	CUCAACAA G CACGUCAA	826	UUGACGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUUGAG	2541
255	ACAAGCAC G UCAAAAGC	827	GCUUUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGCUUGU	2542
262	CGUCAAAA G CUACAGAA	828	UUCUGUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUGACG	2543
326	GUAUCAUC G UGAUGCUU	829	AAGCAUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUGAUAC	2544
342	UCUCUGAA G UUCUGCUA	830	UAGCAGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCAGAGA	2545
368	GAUCUGCA G CUUGCCAC	831	GUGGCAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAGAUC	2546
381	CCACAUCA G CUUAAAAU	832	AUUUUAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAUGUGG	2547
443	CUUCCUGA G UAGAAGAG	833	CUCUUCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAGGAAG	2548
451	GUAGAAGA G UUUCUUUG	834	CAAAGAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUCUAC	2549
467	GUGAAAAG G UCAAGAUU	835	AAUCUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUUUCAC	2550
537	UGAAAAGG G CUUUAUUU	836	AAAUAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUUUUCA	2551
568	CAAAAUAA G UGUAUAAA	837	UUUAUACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAUUUUG	2552
603	UCAACAUG G CUCACAAA	838	UUUGUGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGUUGA	2553
644	GAUGAAGA G UUUAGUUU	839	AAACUAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUCAUC	2554
649	AGAGUUUA G UUUUAAAA	840	UUUUAAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAACUCU	2555
673	GCCAACAA G UUCACUUC	841	GAAGUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUUGGC	2556
691	UAUAUAAA G CAUUAUUU	842	AAAUAAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUAUAUA	2557
713	CUUUUGAG G UGAAUAUA	843	UAUAUUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCAAAAG	2558
742	AUGUAAAA G CUUCUUUA	844	UAAAGAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUACAU	2559
758	AAUACUAA G UAUUUUUC	845	GAAAAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAGUAUU	2560
769	UUUUUCAG G UCUUCACC	846	GGUGAAGA GGAGGAAACUCC CU UCAAGGACAUGGUCCGGG CUGAAAAA	2561
780	UUCACCAA G UAUCAAAG	847	CUUUGAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGUGAA	2562
788	GUAUCAAA G UAAUAACA	848	UGUUAUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUGAUAC	2563
805	CAAAUGAA G UGUCAUUA	849	UAAUGACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCAUUUG	2564
823	UCAAAAUA G UCCACUGA	850	UCAGUGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAUUUUGA	2565
872	UAUUUGUA G UAACUAUC	851	GAUAGUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACAAAUA	2566
941	CUUUUAAA G UUGAUGAG	852	CUCAUCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUAAAAG	2567

Table 29

956	AGAAUCAA G UAUGGAAA	853	UUUCCAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGAUUCU	2568
966	AUGGAAAA G UAAGGCCA	854	UGGCCUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUCCAU	2569
971	AAAGUAAG G CCAUACUC	855	GAGUAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUACUUU	2570
1003	CCUUUUAA G UAAUUUUU	856	AAAAAUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAAAAGG	2571
1033	GAAUUCUA G UACAUGUA	857	UACAUGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGAAUUC	2572
1043	ACAUGUAG G UAAAUCAU	858	AUGAUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUACAUGU	2573
1091	GAGAACUG G UGGUUAAU	859	AUUAACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGUUCUC	2574
1094	AACUGGUG G UUAAUAUG	860	CAUAUUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCAGUU	2575
1108	AUGUGACA G UGAGAUUA	861	UAAUCUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCACAU	2576
1117	UGAGAUUA G UCAUAUCA	862	UGAUAUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAUCUCA	2577
1163	CAUUUAAG G CACUGUAG	863	CUACAGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUAAAUG	2578
1171	GCACUGUA G UGAAUUAU	864	AUAAUUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACAGUGC	2579
1184	UUAUCUGA G CUAGAGUU	865	AACUCUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAGAUAA	2580
1190	GAGCUAGA G UUACCUAG	866	CUAGGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUAGCUC	2581
1198	GUUACCUA G CUUACCAU	867	AUGGUAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGGUAAC	2582
1257	UUUUGCAG G UUGUCUUC	868	GAAGACAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCAAAA	2583
1273	CCAUUCCA G CCUAACAU	869	AUGUUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAAUGG	2584
1291	CAAUGCAG G CAAGGAAA	870	UUUCCUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCAUUG	2585
1314	GAUUUCCA G UGACAGAA	871	UUCUGUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAAAUC	2586
1339	UAUCUCAA G UAUUUUUU	872	AAAAAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGAGAUA	2587
1416	ACUUGUUG G CCCAUCUA	873	UAGAUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACAAGU	2588
1436	CAUCUACA G CUGACCCU	874	AGGGUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUAGAUG	2589
1456	ACAUGGGG G UUAGGGGA	875	UCCCCUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCAUGU	2590
1465	UUAGGGGA G CUGACAAU	876	AUUGUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCCUAA	2591
1476	GACAAUUC G UGGGUCCG	877	CGGACCCA GGAGGAAACUCC CU UCAAGGACAUGGUCCGGG GAAUUGUC	2592
1480	AUUCGUGG G UCCGCAAA	878	UUUGCGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACGAAU	2593
1506	ACCUAAUA G CCUACUAU	879	AUAGUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAUUAGGU	2594
1545	CAUAAACA G UAAAUUAA	880	UUAAUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUUAUG	2595
1566	UAUUUUGC G UGUUAUAU	881	AUAUAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAAAAUA	2596
1603	ACAAUAAA G UAAGCUAG	882	CUAGCUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUAUUGU	2597
1607	UAAAGUAA G CUAGAGAA	883	UUCUCUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUACUUUA	2598

Table 29

9	CAGAGUCA G AAAACUCC	1060	GGAGUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGACUCUG	2599
36	ACCCGUAA G ACUUCAUA	1061	UAUGAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUACGGGU	2600
84	GCUGCCAA G GCUACCUA	1062	UAGGUAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGCAGC	2601
96	ACCUAAAA G AAGACAGU	1063	ACUGUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUAGGU	2602
99	UAAAAGAA G ACAGUUAU	1064	AUAACUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUUUUA	2603
117	UCAUAUUU G GCUGCCAG	1065	CUGGCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUAUGA	2604
160	AAACUUCA G ACUUCCUG	1066	CAGGAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAAGUUU	2605
176	GUCCUGCU G GUAUCAUG	1067	CAUGAUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGGAC	2606
184	GGUAUCAU G GAGAAAGU	1068	ACUUUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAUACC	2607
185	GUAUCAUG G AGAAAGUC	1069	GACUUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGAUAC	2608
187	AUCAUGGA G AAAGUCCA	1070	UGGACUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAUGAU	2609
219	AGCUAUAA G AAGAGCCU	1071	AGGCUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAUAGCU	2610
222	UAUAAGAA G AGCCUCAA	1072	UUGAGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUUAUA	2611
268	AAGCUACA G AAUCUAUU	1073	AAUAGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUAGCUU	2612
360	AACCUCUA G AUCUGCAG	1074	CUGCAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGAGGUU	2613
405	CCCAUGCA G ACAGGAAA	1075	UUUCCUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAUGGG	2614
409	UGCAGACA G GAAAACAA	1076	UUGUUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCUGCA	2615
410	GCAGACAG G AAAACAAU	1077	AUUGUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUCUGC	2616
430	GUAUAACA G ACCACUUC	1078	GAAGUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUAUAC	2617
446	CCUGAGUA G AAGAGUUU	1079	AAACUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACUCAGG	2618
449	GAGUAGAA G AGUUUCUU	1080	AAGAAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUACUC	2619
466	UGUGAAAA G GUCAAGAU	1081	AUCUUGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUCACA	2620
472	AAGGUCAA G AUUAAGAC	1082	GUCUUAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGACCUU	2621
478	AAGAUUAA G ACUAAAAC	1083	GUUUUAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAAUCUU	2622
515	CAUCUGUU G GAUCUUGU	1084	ACAAGAUC GGAGGAAACUCC CU UCAAGGACAUGGUCCGGG AACAGAUG	2623
516	AUCUGUUG G AUCUUGUA	1085	UACAAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACAGAU	2624
535	CAUGAAAA G GGCUUUAU	1086	AUAAAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUCAUG	2625
536	AUGAAAAG G GCUUUAUU	1087	AAUAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUUUCAU	2626
602	CUCAACAU G GCUCACAA	1088	UUGUGAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGUUGAG	2627
636	UUUCUGAA G AUGAAGAG	1089	CUCUUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCAGAAA	2628
642	AAGAUGAA G AGUUUAGU	1090	ACUAAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCAUCUU	2629

Table 29

712	UCUUUUGA G GUGAAUAU	1091	AUAUUCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAAAAGA	2630
768	AUUUUUCA G GUCUUCAC	1092	GUGAAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAAAAAU	2631
860	AUUAUAAA G AACUAUUU	1093	AAAUAGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUAUAAU	2632
882	AACUAUCA G AAUCUACA	1094	UGUAGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAUAGUU	2633
901	CUAAAACA G AAAUUGUA	1095	UACAAUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUUUAG	2634
949	GUUGAUGA G AAUCAAGU	1096	ACUUGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAUCAAC	2635
960	UCAAGUAU G GAAAAGUA	1097	UACUUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUACUUGA	2636
961	CAAGUAUG G AAAAGUAA	1098	UUACUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUACUUG	2637
970	AAAAGUAA G GCCAUACU	1099	AGUAUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUACUUUU	2638
1017	UUUUCAAA G AAUCACAG	1100	CUGUGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUGAAAA	2639
1025	GAAUCACA G AAUUCUAG	1101	CUAGAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGAUUC	2640
1042	UACAUGUA G GUAAAUCA	1102	UGAUUUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACAUGUA	2641
1065	UGUUCUAA G ACAUAUGA	1103	UCAUAUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAGAACA	2642
1080	GAUCAACA G AUGAGAAC	1104	GUUCUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUGAUC	2643
1085	ACAGAUGA G AACUGGUG	1105	CACCAGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAUCUGU	2644
1090	UGAGAACU G GUGGUUAA	1106	UUAACCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUCUCA	2645
1093	GAACUGGU G GUUAAUAU	1107	AUAUUAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAGUUC	2646
1112	GACAGUGA G AUUAGUCA	1108	UGACUAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCACUGUC	2647
1143	UAACAACA G AAUCUAAU	1109	AUUAGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUGUUA	2648
1162	UCAUUUAA G GCACUGUA	1110	UACAGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAAAUGA	2649
1188	CUGAGCUA G AGUUACCU	1111	AGGUAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGCUCAG	2650
1218	AUAUCUUU G GAAUCAUG	1112	CAUGAUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGAUAU	2651
1219	UAUCUUUG G AAUCAUGA	1113	UCAUGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAGAUA	2652
1236	AACCUUAA G ACUUCAGA	1114	UCUGAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAAGGUU	2653
1243	AGACUUCA G AAUGAUUU	1115	AAAUCAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAAGUCU	2654
1256	AUUUUGCA G GUUGUCUU	1116	AAGACAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAAAAU	2655
1290	CCAAUGCA G GCAAGGAA	1117	UUCCUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAUUGG	2656
1295	GCAGGCAA G GAAAAUAA	1118	UUAUUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGCCUGC	2657
1296	CAGGCAAG G AAAAUAAA	1119	UUUAUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGCCUG	2658
1306	AAAUAAAA G AUUUCCAG	1120	CUGGAAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUAUUU	2659
1320	CAGUGACA G AAAAAUAU	1121	AUAUUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUCACUG	2660

Table 29

1390	AAUUAUUA G AUUAUAUU	1122	AAUAUAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAUAAUU	2661
1415	AACUUGUU G GCCCAUCU	1123	AGAUGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAAGUU	2662
1452	UUGAACAU G GGGGUUAG	1124	CUAACCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGUUCAA	2663
1453	UGAACAUG G GGGUUAGG	1125	CCUAACCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGUUCA	2664
1454	GAACAUGG G GGUUAGGG	1126	CCCUAACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUGUUC	2665
1455	AACAUGGG G GUUAGGGG	1127	CCCCUAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAUGUU	2666
1460	GGGGGUUA G GGGAGCUG	1128	CAGCUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAACCCCC	2667
1461	GGGGUUAG G GGAGCUGA	1129	UCAGCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAACCCC	2668
1462	GGGUUAGG G GAGCUGAC	1130	GUCAGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUAACCC	2669
1463	GGUUAGGG G AGCUGACA	1131	UGUCAGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCUAACC	2670
1478	CAAUUCGU G GGUCCGCA	1132	UGCGGACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGAAUUG	2671
1479	AAUUCGUG G GUCCGCAA	1133	UUGCGGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACGAAUU	2672
1611	GUAAGCUA G AGAAAAUG	1134	CAUUUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGCUUAC	2673
1613	AAGCUAGA G AAAAUGUU	1135	AACAUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUAGCUU	2674
1627	GUUAUUUA G AAAAUCAU	1136	AUGAUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAAUAAC	2675

Input Sequence = PLN. Cut Site = G/.
Stem Length = 8. Core Sequence = GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG
PLN (Homo sapiens phospholamban (PLN) mRNA.; 1635 bp)

Table 30

Table 30: Human Phospholamban (PLN) Antisense and Target Sequence

Pos	Target	Seq ID	Antisense	AS Seq ID
1	CAGAGUCAGAAAACUCCCCAGCUAA	2447	TTAGCTGGGGAGTTTTCTGACTCTG	3051
2	AGAGUCAGAAAACUCCCCAGCUAAA	2448	TTTAGCTGGGGAGTTTTCTGACTCT	3052
3	GAGUCAGAAAACUCCCCAGCUAAAC	2449	GTTTAGCTGGGGAGTTTTCTGACTC	3053
4	AGUCAGAAAACUCCCCAGCUAAACA	2450	TGTTTAGCTGGGGAGTTTTCTGACT	3054
5	GUCAGAAAACUCCCCAGCUAAACAC	2451	GTGTTTAGCTGGGGAGTTTTCTGAC	3055
6	UCAGAAAACUCCCCAGCUAAACACC	2452	GGTGTTTAGCTGGGGAGTTTTCTGA	3056
7	CAGAAAACUCCCCAGCUAAACACCC	2453	GGGTGTTTAGCTGGGGAGTTTTCTG	3057
8	AGAAAACUCCCCAGCUAAACACCCG	2454	CGGGTGTTTAGCTGGGGAGTTTTCT	3058
9	GAAAACUCCCCAGCUAAACACCCGU	2455	ACGGGTGTTTAGCTGGGGAGTTTTC	3059
10	AAAACUCCCCAGCUAAACACCCGUA	2456	TACGGGTGTTTAGCTGGGGAGTTTT	3060
11	AAACUCCCCAGCUAAACACCCGUAA	2457	TTACGGGTGTTTAGCTGGGGAGTTT	3061
12	AACUCCCCAGCUAAACACCCGUAAG	2458	CTTACGGGTGTTTAGCTGGGGAGTT	3062
13	ACUCCCCAGCUAAACACCCGUAAGA	2459	TCTTACGGGTGTTTAGCTGGGGAGT	3063
14	CUCCCCAGCUAAACACCCGUAAGAC	2460	GTCTTACGGGTGTTTAGCTGGGGAG	3064
15	UCCCCAGCUAAACACCCGUAAGACU	2461	AGTCTTACGGGTGTTTAGCTGGGGA	3065
16	CCCCAGCUAAACACCCGUAAGACUU	2462	AAGTCTTACGGGTGTTTAGCTGGGG	3066
17	CCCAGCUAAACACCCGUAAGACUUC	2463	GAAGTCTTACGGGTGTTTAGCTGGG	3067
18	CCAGCUAAACACCCGUAAGACUUCA	2464	TGAAGTCTTACGGGTGTTTAGCTGG	3068
19	CAGCUAAACACCCGUAAGACUUCAU	2465	ATGAAGTCTTACGGGTGTTTAGCTG	3069
20	AGCUAAACACCCGUAAGACUUCAUA	2466	TATGAAGTCTTACGGGTGTTTAGCT	3070
21	GCUAAACACCCGUAAGACUUCAUAC	2467	GTATGAAGTCTTACGGGTGTTTAGC	3071
22	CUAAACACCCGUAAGACUUCAUACA	2468	TGTATGAAGTCTTACGGGTGTTTAG	3072
23	UAAACACCCGUAAGACUUCAUACAA	2469	TTGTATGAAGTCTTACGGGTGTTTA	3073
24	AAACACCCGUAAGACUUCAUACAAC	2470	GTTGTATGAAGTCTTACGGGTGTTT	3074
25	AACACCCGUAAGACUUCAUACAACA	2471	TGTTGTATGAAGTCTTACGGGTGTT	3075
26	ACACCCGUAAGACUUCAUACAACAC	2472	GTGTTGTATGAAGTCTTACGGGTGT	3076
27	CACCCGUAAGACUUCAUACAACACA	2473	TGTGTTGTATGAAGTCTTACGGGTG	3077
28	ACCCGUAAGACUUCAUACAACACAA	2474	TTGTGTTGTATGAAGTCTTACGGGT	3078
29	CCCGUAAGACUUCAUACAACACAAU	2475	ATTGTGTTGTATGAAGTCTTACGGG	3079
63	UGUGAUGAUCACAGCUGCCAAGGCU	2476	AGCCTTGGCAGCTGTGATCATCACA	3080
64	GUGAUGAUCACAGCUGCCAAGGCUA	2477	TAGCCTTGGCAGCTGTGATCATCAC	3081
65	UGAUGAUCACAGCUGCCAAGGCUAC	2478	GTAGCCTTGGCAGCTGTGATCATCA	3082
66	GAUGAUCACAGCUGCCAAGGCUACC	2479	GGTAGCCTTGGCAGCTGTGATCATC	3083
67	AUGAUCACAGCUGCCAAGGCUACCU	2480	AGGTAGCCTTGGCAGCTGTGATCAT	3084
68	UGAUCACAGCUGCCAAGGCUACCUA	2481	TAGGTAGCCTTGGCAGCTGTGATCA	3085
69	GAUCACAGCUGCCAAGGCUACCUAA	2482	TTAGGTAGCCTTGGCAGCTGTGATC	3086
70	AUCACAGCUGCCAAGGCUACCUAAA	2483	TTTAGGTAGCCTTGGCAGCTGTGAT	3087
71	UCACAGCUGCCAAGGCUACCUAAAA	2484	TTTTAGGTAGCCTTGGCAGCTGTGA	3088
72	CACAGCUGCCAAGGCUACCUAAAAG	2485	CTTTTAGGTAGCCTTGGCAGCTGTG	3089
73	ACAGCUGCCAAGGCUACCUAAAAGA	2486	TCTTTTAGGTAGCCTTGGCAGCTGT	3090
74	CAGCUGCCAAGGCUACCUAAAAGAA	2487	TTCTTTTAGGTAGCCTTGGCAGCTG	3091
75	AGCUGCCAAGGCUACCUAAAAGAAG	2488	CTTCTTTTAGGTAGCCTTGGCAGCT	3092
76	GCUGCCAAGGCUACCUAAAAGAAGA	2489	TCTTCTTTTAGGTAGCCTTGGCAGC	3093
77	CUGCCAAGGCUACCUAAAAGAAGAC	2490	GTCTTCTTTTAGGTAGCCTTGGCAG	3094

Table 30

78	UGCCAAGGCUACCUAAAAGAAGACA	2491	TGTCTTCTTTTAGGTAGCCTTGGCA	3095
79	GCCAAGGCUACCUAAAAGAAGACAG	2492	CTGTCTTCTTTTAGGTAGCCTTGGC	3096
80	CCAAGGCUACCUAAAAGAAGACAGU	2493	ACTGTCTTCTTTTAGGTAGCCTTGG	3097
81	CAAGGCUACCUAAAAGAAGACAGUU	2494	AACTGTCTTCTTTTAGGTAGCCTTG	3098
98	AGACAGUUAUCUCAUAUUUGGCUGC	2495	GCAGCCAAATATGAGATAACTGTCT	3099
99	GACAGUUAUCUCAUAUUUGGCUGCC	2496	GGCAGCCAAATATGAGATAACTGTC	3100
100	ACAGUUAUCUCAUAUUUGGCUGCCA	2497	TGGCAGCCAAATATGAGATAACTGT	3101
101	CAGUUAUCUCAUAUUUGGCUGCCAG	2498	CTGGCAGCCAAATATGAGATAACTG	3102
102	AGUUAUCUCAUAUUUGGCUGCCAGC	2499	GCTGGCAGCCAAATATGAGATAACT	3103
103	GUUAUCUCAUAUUUGGCUGCCAGCU	2500	AGCTGGCAGCCAAATATGAGATAAC	3104
104	UUAUCUCAUAUUUGGCUGCCAGCUU	2501	AAGCTGGCAGCCAAATATGAGATAA	3105
105	UAUCUCAUAUUUGGCUGCCAGCUUU	2502	AAAGCTGGCAGCCAAATATGAGATA	3106
106	AUCUCAUAUUUGGCUGCCAGCUUUU	2503	AAAAGCTGGCAGCCAAATATGAGAT	3107
107	UCUCAUAUUUGGCUGCCAGCUUUUU	2504	AAAAAGCTGGCAGCCAAATATGAGA	3108
108	CUCAUAUUUGGCUGCCAGCUUUUUA	2505	TAAAAAGCTGGCAGCCAAATATGAG	3109
109	UCAUAUUUGGCUGCCAGCUUUUUAU	2506	ATAAAAAGCTGGCAGCCAAATATGA	3110
110	CAUAUUUGGCUGCCAGCUUUUUAUC	2507	GATAAAAAGCTGGCAGCCAAATATG	3111
111	AUAUUUGGCUGCCAGCUUUUUAUCU	2508	AGATAAAAAGCTGGCAGCCAAATAT	3112
112	UAUUUGGCUGCCAGCUUUUUAUCUU	2509	AAGATAAAAAGCTGGCAGCCAAATA	3113
113	AUUUGGCUGCCAGCUUUUUAUCUUU	2510	AAAGATAAAAAGCTGGCAGCCAAAT	3114
114	UUUGGCUGCCAGCUUUUUAUCUUUC	2511	GAAAGATAAAAAGCTGGCAGCCAAA	3115
115	UUGGCUGCCAGCUUUUUAUCUUUCU	2512	AGAAAGATAAAAAGCTGGCAGCCAA	3116
116	UGGCUGCCAGCUUUUUAUCUUUCUC	2513	GAGAAAGATAAAAAGCTGGCAGCCA	3117
117	GGCUGCCAGCUUUUUAUCUUUCUCU	2514	AGAGAAAGATAAAAAGCTGGCAGCC	3118
118	GCUGCCAGCUUUUUAUCUUUCUCUC	2515	GAGAGAAAGATAAAAAGCTGGCAGC	3119
119	CUGCCAGCUUUUUAUCUUUCUCUCG	2516	CGAGAGAAAGATAAAAAGCTGGCAG	3120
120	UGCCAGCUUUUUAUCUUUCUCUCGA	2517	TCGAGAGAAAGATAAAAAGCTGGCA	3121
121	GCCAGCUUUUUAUCUUUCUCUCGAC	2518	GTCGAGAGAAAGATAAAAAGCTGGC	3122
122	CCAGCUUUUUAUCUUUCUCUCGACC	2519	GGTCGAGAGAAAGATAAAAAGCTGG	3123
123	CAGCUUUUUAUCUUUCUCUCGACCA	2520	TGGTCGAGAGAAAGATAAAAAGCTG	3124
124	AGCUUUUUAUCUUUCUCUCGACCAC	2521	GTGGTCGAGAGAAAGATAAAAAGCT	3125
125	GCUUUUUAUCUUUCUCUCGACCACU	2522	AGTGGTCGAGAGAAAGATAAAAAGC	3126
126	CUUUUUAUCUUUCUCUCGACCACUU	2523	AAGTGGTCGAGAGAAAGATAAAAAG	3127
132	AUCUUUCUCUCGACCACUUAAAACU	2524	AGTTTTAAGTGGTCGAGAGAAAGAT	3128
133	UCUUUCUCUCGACCACUUAAAACUU	2525	AAGTTTTAAGTGGTCGAGAGAAAGA	3129
134	CUUUCUCUCGACCACUUAAAACUUC	2526	GAAGTTTTAAGTGGTCGAGAGAAAG	3130
135	UUUCUCUCGACCACUUAAAACUUCA	2527	TGAAGTTTTAAGTGGTCGAGAGAAA	3131
136	UUCUCUCGACCACUUAAAACUUCAG	2528	CTGAAGTTTTAAGTGGTCGAGAGAA	3132
137	UCUCUCGACCACUUAAAACUUCAGA	2529	TCTGAAGTTTTAAGTGGTCGAGAGA	3133
138	CUCUCGACCACUUAAAACUUCAGAC	2530	GTCTGAAGTTTTAAGTGGTCGAGAG	3134
139	UCUCGACCACUUAAAACUUCAGACU	2531	AGTCTGAAGTTTTAAGTGGTCGAGA	3135
140	CUCGACCACUUAAAACUUCAGACUU	2532	AAGTCTGAAGTTTTAAGTGGTCGAG	3136
141	UCGACCACUUAAAACUUCAGACUUC	2533	GAAGTCTGAAGTTTTAAGTGGTCGA	3137
142	CGACCACUUAAAACUUCAGACUUCC	2534	GGAAGTCTGAAGTTTTAAGTGGTCG	3138
143	GACCACUUAAAACUUCAGACUUCCU	2535	AGGAAGTCTGAAGTTTTAAGTGGTC	3139
144	ACCACUUAAAACUUCAGACUUCCUG	2536	CAGGAAGTCTGAAGTTTTAAGTGGT	3140
145	CCACUUAAAACUUCAGACUUCCUGU	2537	ACAGGAAGTCTGAAGTTTTAAGTGG	3141

Table 30

147	ACUUAAAACUUCAGACUUCCUGUCC	2538	GGACAGGAAGTCTGAAGTTTTAAGT	3142
148	CUUAAAACUUCAGACUUCCUGUCCU	2539	AGGACAGGAAGTCTGAAGTTTTAAG	3143
149	UUAAAACUUCAGACUUCCUGUCCUG	2540	CAGGACAGGAAGTCTGAAGTTTTAA	3144
150	UAAAACUUCAGACUUCCUGUCCUGC	2541	GCAGGACAGGAAGTCTGAAGTTTTA	3145
151	AAAACUUCAGACUUCCUGUCCUGCU	2542	AGCAGGACAGGAAGTCTGAAGTTTT	3146
152	AAACUUCAGACUUCCUGUCCUGCUG	2543	CAGCAGGACAGGAAGTCTGAAGTTT	3147
153	AACUUCAGACUUCCUGUCCUGCUGG	2544	CCAGCAGGACAGGAAGTCTGAAGTT	3148
154	ACUUCAGACUUCCUGUCCUGCUGGU	2545	ACCAGCAGGACAGGAAGTCTGAAGT	3149
155	CUUCAGACUUCCUGUCCUGCUGGUA	2546	TACCAGCAGGACAGGAAGTCTGAAG	3150
156	UUCAGACUUCCUGUCCUGCUGGUAU	2547	ATACCAGCAGGACAGGAAGTCTGAA	3151
157	UCAGACUUCCUGUCCUGCUGGUAUC	2548	GATACCAGCAGGACAGGAAGTCTGA	3152
158	CAGACUUCCUGUCCUGCUGGUAUCA	2549	TGATACCAGCAGGACAGGAAGTCTG	3153
159	AGACUUCCUGUCCUGCUGGUAUCAU	2550	ATGATACCAGCAGGACAGGAAGTCT	3154
160	GACUUCCUGUCCUGCUGGUAUCAUG	2551	CATGATACCAGCAGGACAGGAAGTC	3155
161	ACUUCCUGUCCUGCUGGUAUCAUGG	2552	CCATGATACCAGCAGGACAGGAAGT	3156
162	CUUCCUGUCCUGCUGGUAUCAUGGA	2553	TCCATGATACCAGCAGGACAGGAAG	3157
163	UUCCUGUCCUGCUGGUAUCAUGGAG	2554	CTCCATGATACCAGCAGGACAGGAA	3158
164	UCCUGUCCUGCUGGUAUCAUGGAGA	2555	TCTCCATGATACCAGCAGGACAGGA	3159
165	CCUGUCCUGCUGGUAUCAUGGAGAA	2556	TTCTCCATGATACCAGCAGGACAGG	3160
166	CUGUCCUGCUGGUAUCAUGGAGAAA	2557	TTTCTCCATGATACCAGCAGGACAG	3161
167	UGUCCUGCUGGUAUCAUGGAGAAAG	2558	CTTTCTCCATGATACCAGCAGGACA	3162
168	GUCCUGCUGGUAUCAUGGAGAAAGU	2559	ACTTTCTCCATGATACCAGCAGGAC	3163
169	UCCUGCUGGUAUCAUGGAGAAAGUC	2560	GACTTTCTCCATGATACCAGCAGGA	3164
170	CCUGCUGGUAUCAUGGAGAAAGUCC	2561	GGACTTTCTCCATGATACCAGCAGG	3165
180	UCAUGGAGAAAGUCCAAUACCUCAC	2562	GTGAGGTATTGGACTTTCTCCATGA	3166
181	CAUGGAGAAAGUCCAAUACCUCACU	2563	AGTGAGGTATTGGACTTTCTCCATG	3167
182	AUGGAGAAAGUCCAAUACCUCACUC	2564	GAGTGAGGTATTGGACTTTCTCCAT	3168
183	UGGAGAAAGUCCAAUACCUCACUCG	2565	CGAGTGAGGTATTGGACTTTCTCCA	3169
184	GGAGAAAGUCCAAUACCUCACUCGC	2566	GCGAGTGAGGTATTGGACTTTCTCC	3170
185	GAGAAAGUCCAAUACCUCACUCGCU	2567	AGCGAGTGAGGTATTGGACTTTCTC	3171
186	AGAAAGUCCAAUACCUCACUCGCUC	2568	GAGCGAGTGAGGTATTGGACTTTCT	3172
187	GAAAGUCCAAUACCUCACUCGCUCA	2569	TGAGCGAGTGAGGTATTGGACTTTC	3173
188	AAAGUCCAAUACCUCACUCGCUCAG	2570	CTGAGCGAGTGAGGTATTGGACTTT	3174
189	AAGUCCAAUACCUCACUCGCUCAGC	2571	GCTGAGCGAGTGAGGTATTGGACTT	3175
190	AGUCCAAUACCUCACUCGCUCAGCU	2572	AGCTGAGCGAGTGAGGTATTGGACT	3176
191	GUCCAAUACCUCACUCGCUCAGCUA	2573	TAGCTGAGCGAGTGAGGTATTGGAC	3177
192	UCCAAUACCUCACUCGCUCAGCUAU	2574	ATAGCTGAGCGAGTGAGGTATTGGA	3178
193	CCAAUACCUCACUCGCUCAGCUAUA	2575	TATAGCTGAGCGAGTGAGGTATTGG	3179
194	CAAUACCUCACUCGCUCAGCUAUAA	2576	TTATAGCTGAGCGAGTGAGGTATTG	3180
195	AAUACCUCACUCGCUCAGCUAUAAG	2577	CTTATAGCTGAGCGAGTGAGGTATT	3181
196	AUACCUCACUCGCUCAGCUAUAAGA	2578	TCTTATAGCTGAGCGAGTGAGGTAT	3182
197	UACCUCACUCGCUCAGCUAUAAGAA	2579	TTCTTATAGCTGAGCGAGTGAGGTA	3183
198	ACCUCACUCGCUCAGCUAUAAGAAG	2580	CTTCTTATAGCTGAGCGAGTGAGGT	3184
199	CCUCACUCGCUCAGCUAUAAGAAGA	2581	TCTTCTTATAGCTGAGCGAGTGAGG	3185
200	CUCACUCGCUCAGCUAUAAGAAGAG	2582	CTCTTCTTATAGCTGAGCGAGTGAG	3186
201	UCACUCGCUCAGCUAUAAGAAGAGC	2583	GCTCTTCTTATAGCTGAGCGAGTGA	3187
202	CACUCGCUCAGCUAUAAGAAGAGCC	2584	GGCTCTTCTTATAGCTGAGCGAGTG	3188

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203	ACUCGCUCAGCUAUAAGAAGAGCCU	2585	AGGCTCTTCTTATAGCTGAGCGAGT	3189
204	CUCGCUCAGCUAUAAGAAGAGCCUC	2586	GAGGCTCTTCTTATAGCTGAGCGAG	3190
205	UCGCUCAGCUAUAAGAAGAGCCUCA	2587	TGAGGCTCTTCTTATAGCTGAGCGA	3191
206	CGCUCAGCUAUAAGAAGAGCCUCAA	2588	TTGAGGCTCTTCTTATAGCTGAGCG	3192
207	GCUCAGCUAUAAGAAGAGCCUCAAC	2589	GTTGAGGCTCTTCTTATAGCTGAGC	3193
208	CUCAGCUAUAAGAAGAGCCUCAACC	2590	GGTTGAGGCTCTTCTTATAGCTGAG	3194
209	UCAGCUAUAAGAAGAGCCUCAACCA	2591	TGGTTGAGGCTCTTCTTATAGCTGA	3195
210	CAGCUAUAAGAAGAGCCUCAACCAU	2592	ATGGTTGAGGCTCTTCTTATAGCTG	3196
211	AGCUAUAAGAAGAGCCUCAACCAUU	2593	AATGGTTGAGGCTCTTCTTATAGCT	3197
212	GCUAUAAGAAGAGCCUCAACCAUUG	2594	CAATGGTTGAGGCTCTTCTTATAGC	3198
213	CUAUAAGAAGAGCCUCAACCAUUGA	2595	TCAATGGTTGAGGCTCTTCTTATAG	3199
214	UAUAAGAAGAGCCUCAACCAUUGAA	2596	TTCAATGGTTGAGGCTCTTCTTATA	3200
215	AUAAGAAGAGCCUCAACCAUUGAAA	2597	TTTCAATGGTTGAGGCTCTTCTTAT	3201
216	UAAGAAGAGCCUCAACCAUUGAAAU	2598	ATTTCAATGGTTGAGGCTCTTCTTA	3202
217	AAGAAGAGCCUCAACCAUUGAAAUG	2599	CATTTCAATGGTTGAGGCTCTTCTT	3203
218	AGAAGAGCCUCAACCAUUGAAAUGC	2600	GCATTTCAATGGTTGAGGCTCTTCT	3204
219	GAAGAGCCUCAACCAUUGAAAUGCC	2601	GGCATTTCAATGGTTGAGGCTCTTC	3205
220	AAGAGCCUCAACCAUUGAAAUGCCU	2602	AGGCATTTCAATGGTTGAGGCTCTT	3206
221	AGAGCCUCAACCAUUGAAAUGCCUC	2603	GAGGCATTTCAATGGTTGAGGCTCT	3207
222	GAGCCUCAACCAUUGAAAUGCCUCA	2604	TGAGGCATTTCAATGGTTGAGGCTC	3208
223	AGCCUCAACCAUUGAAAUGCCUCAA	2605	TTGAGGCATTTCAATGGTTGAGGCT	3209
224	GCCUCAACCAUUGAAAUGCCUCAAC	2606	GTTGAGGCATTTCAATGGTTGAGGC	3210
225	CCUCAACCAUUGAAAUGCCUCAACA	2607	TGTTGAGGCATTTCAATGGTTGAGG	3211
226	CUCAACCAUUGAAAUGCCUCAACAA	2608	TTGTTGAGGCATTTCAATGGTTGAG	3212
227	UCAACCAUUGAAAUGCCUCAACAAG	2609	CTTGTTGAGGCATTTCAATGGTTGA	3213
228	CAACCAUUGAAAUGCCUCAACAAGC	2610	GCTTGTTGAGGCATTTCAATGGTTG	3214
229	AACCAUUGAAAUGCCUCAACAAGCA	2611	TGCTTGTTGAGGCATTTCAATGGTT	3215
230	ACCAUUGAAAUGCCUCAACAAGCAC	2612	GTGCTTGTTGAGGCATTTCAATGGT	3216
231	CCAUUGAAAUGCCUCAACAAGCACG	2613	CGTGCTTGTTGAGGCATTTCAATGG	3217
232	CAUUGAAAUGCCUCAACAAGCACGU	2614	ACGTGCTTGTTGAGGCATTTCAATG	3218
233	AUUGAAAUGCCUCAACAAGCACGUC	2615	GACGTGCTTGTTGAGGCATTTCAAT	3219
234	UUGAAAUGCCUCAACAAGCACGUCA	2616	TGACGTGCTTGTTGAGGCATTTCAA	3220
235	UGAAAUGCCUCAACAAGCACGUCAA	2617	TTGACGTGCTTGTTGAGGCATTTCA	3221
236	GAAAUGCCUCAACAAGCACGUCAAA	2618	TTTGACGTGCTTGTTGAGGCATTTC	3222
237	AAAUGCCUCAACAAGCACGUCAAAA	2619	TTTTGACGTGCTTGTTGAGGCATTT	3223
238	AAUGCCUCAACAAGCACGUCAAAAG	2620	CTTTTGACGTGCTTGTTGAGGCATT	3224
239	AUGCCUCAACAAGCACGUCAAAAGC	2621	GCTTTTGACGTGCTTGTTGAGGCAT	3225
240	UGCCUCAACAAGCACGUCAAAAGCU	2622	AGCTTTTGACGTGCTTGTTGAGGCA	3226
241	GCCUCAACAAGCACGUCAAAAGCUA	2623	TAGCTTTTGACGTGCTTGTTGAGGC	3227
242	CCUCAACAAGCACGUCAAAAGCUAC	2624	GTAGCTTTTGACGTGCTTGTTGAGG	3228
243	CUCAACAAGCACGUCAAAAGCUACA	2625	TGTAGCTTTTGACGTGCTTGTTGAG	3229
244	UCAACAAGCACGUCAAAAGCUACAG	2626	CTGTAGCTTTTGACGTGCTTGTTGA	3230
245	CAACAAGCACGUCAAAAGCUACAGA	2627	TCTGTAGCTTTTGACGTGCTTGTTG	3231
246	AACAAGCACGUCAAAAGCUACAGAA	2628	TTCTGTAGCTTTTGACGTGCTTGTT	3232
247	ACAAGCACGUCAAAAGCUACAGAAU	2629	ATTCTGTAGCTTTTGACGTGCTTGT	3233
248	CAAGCACGUCAAAAGCUACAGAAUC	2630	GATTCTGTAGCTTTTGACGTGCTTG	3234
249	AAGCACGUCAAAAGCUACAGAAUCU	2631	AGATTCTGTAGCTTTTGACGTGCTT	3235

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250	AGCACGUCAAAAGCUACAGAAUCUA	2632	TAGATTCTGTAGCTTTTGACGTGCT	3236
251	GCACGUCAAAAGCUACAGAAUCUAU	2633	ATAGATTCTGTAGCTTTTGACGTGC	3237
252	CACGUCAAAAGCUACAGAAUCUAUU	2634	AATAGATTCTGTAGCTTTTGACGTG	3238
253	ACGUCAAAAGCUACAGAAUCUAUUU	2635	AAATAGATTCTGTAGCTTTTGACGT	3239
254	CGUCAAAAGCUACAGAAUCUAUUUA	2636	TAAATAGATTCTGTAGCTTTTGACG	3240
255	GUCAAAAGCUACAGAAUCUAUUUAU	2637	ATAAATAGATTCTGTAGCTTTTGAC	3241
256	UCAAAAGCUACAGAAUCUAUUUAUC	2638	GATAAATAGATTCTGTAGCTTTTGA	3242
257	CAAAAGCUACAGAAUCUAUUUAUCA	2639	TGATAAATAGATTCTGTAGCTTTTG	3243
258	AAAAGCUACAGAAUCUAUUUAUCAA	2640	TTGATAAATAGATTCTGTAGCTTTT	3244
259	AAAGCUACAGAAUCUAUUUAUCAAU	2641	ATTGATAAATAGATTCTGTAGCTTT	3245
260	AAGCUACAGAAUCUAUUUAUCAAUU	2642	AATTGATAAATAGATTCTGTAGCTT	3246
261	AGCUACAGAAUCUAUUUAUCAAUUU	2643	AAATTGATAAATAGATTCTGTAGCT	3247
262	GCUACAGAAUCUAUUUAUCAAUUUC	2644	GAAATTGATAAATAGATTCTGTAGC	3248
263	CUACAGAAUCUAUUUAUCAAUUUCU	2645	AGAAATTGATAAATAGATTCTGTAG	3249
264	UACAGAAUCUAUUUAUCAAUUUCUG	2646	CAGAAATTGATAAATAGATTCTGTA	3250
265	ACAGAAUCUAUUUAUCAAUUUCUGU	2647	ACAGAAATTGATAAATAGATTCTGT	3251
266	CAGAAUCUAUUUAUCAAUUUCUGUC	2648	GACAGAAATTGATAAATAGATTCTG	3252
267	AGAAUCUAUUUAUCAAUUUCUGUCU	2649	AGACAGAAATTGATAAATAGATTCT	3253
268	GAAUCUAUUUAUCAAUUUCUGUCUC	2650	GAGACAGAAATTGATAAATAGATTC	3254
269	AAUCUAUUUAUCAAUUUCUGUCUCA	2651	TGAGACAGAAATTGATAAATAGATT	3255
270	AUCUAUUUAUCAAUUUCUGUCUCAU	2652	ATGAGACAGAAATTGATAAATAGAT	3256
271	UCUAUUUAUCAAUUUCUGUCUCAUC	2653	GATGAGACAGAAATTGATAAATAGA	3257
272	CUAUUUAUCAAUUUCUGUCUCAUCU	2654	AGATGAGACAGAAATTGATAAATAG	3258
273	UAUUUAUCAAUUUCUGUCUCAUCUU	2655	AAGATGAGACAGAAATTGATAAATA	3259
274	AUUUAUCAAUUUCUGUCUCAUCUUA	2656	TAAGATGAGACAGAAATTGATAAAT	3260
275	UUUAUCAAUUUCUGUCUCAUCUUAA	2657	TTAAGATGAGACAGAAATTGATAAA	3261
276	UUAUCAAUUUCUGUCUCAUCUUAAU	2658	ATTAAGATGAGACAGAAATTGATAA	3262
277	UAUCAAUUUCUGUCUCAUCUUAAUA	2659	TATTAAGATGAGACAGAAATTGATA	3263
278	AUCAAUUUCUGUCUCAUCUUAAUAU	2660	ATATTAAGATGAGACAGAAATTGAT	3264
279	UCAAUUUCUGUCUCAUCUUAAUAUG	2661	CATATTAAGATGAGACAGAAATTGA	3265
280	CAAUUUCUGUCUCAUCUUAAUAUGU	2662	ACATATTAAGATGAGACAGAAATTG	3266
281	AAUUUCUGUCUCAUCUUAAUAUGUC	2663	GACATATTAAGATGAGACAGAAATT	3267
282	AUUUCUGUCUCAUCUUAAUAUGUCU	2664	AGACATATTAAGATGAGACAGAAAT	3268
283	UUUCUGUCUCAUCUUAAUAUGUCUC	2665	GAGACATATTAAGATGAGACAGAAA	3269
284	UUCUGUCUCAUCUUAAUAUGUCUCU	2666	AGAGACATATTAAGATGAGACAGAA	3270
285	UCUGUCUCAUCUUAAUAUGUCUCUU	2667	AAGAGACATATTAAGATGAGACAGA	3271
286	CUGUCUCAUCUUAAUAUGUCUCUUG	2668	CAAGAGACATATTAAGATGAGACAG	3272
287	UGUCUCAUCUUAAUAUGUCUCUUGC	2669	GCAAGAGACATATTAAGATGAGACA	3273
288	GUCUCAUCUUAAUAUGUCUCUUGCU	2670	AGCAAGAGACATATTAAGATGAGAC	3274
289	UCUCAUCUUAAUAUGUCUCUUGCUG	2671	CAGCAAGAGACATATTAAGATGAGA	3275
290	CUCAUCUUAAUAUGUCUCUUGCUGA	2672	TCAGCAAGAGACATATTAAGATGAG	3276
291	UCAUCUUAAUAUGUCUCUUGCUGAU	2673	ATCAGCAAGAGACATATTAAGATGA	3277
292	CAUCUUAAUAUGUCUCUUGCUGAUC	2674	GATCAGCAAGAGACATATTAAGATG	3278
293	AUCUUAAUAUGUCUCUUGCUGAUCU	2675	AGATCAGCAAGAGACATATTAAGAT	3279
294	UCUUAAUAUGUCUCUUGCUGAUCUG	2676	CAGATCAGCAAGAGACATATTAAGA	3280
295	CUUAAUAUGUCUCUUGCUGAUCUGU	2677	ACAGATCAGCAAGAGACATATTAAG	3281
296	UUAAUAUGUCUCUUGCUGAUCUGUA	2678	TACAGATCAGCAAGAGACATATTAA	3282

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297	UAAUAUGUCUCUUGCUGAUCUGUAU	2679	ATACAGATCAGCAAGAGACATATTA	3283
298	AAUAUGUCUCUUGCUGAUCUGUAUC	2680	GATACAGATCAGCAAGAGACATATT	3284
299	AUAUGUCUCUUGCUGAUCUGUAUCA	2681	TGATACAGATCAGCAAGAGACATAT	3285
300	UAUGUCUCUUGCUGAUCUGUAUCAU	2682	ATGATACAGATCAGCAAGAGACATA	3286
301	AUGUCUCUUGCUGAUCUGUAUCAUC	2683	GATGATACAGATCAGCAAGAGACAT	3287
302	UGUCUCUUGCUGAUCUGUAUCAUCG	2684	CGATGATACAGATCAGCAAGAGACA	3288
303	GUCUCUUGCUGAUCUGUAUCAUCGU	2685	ACGATGATACAGATCAGCAAGAGAC	3289
304	UCUCUUGCUGAUCUGUAUCAUCGUG	2686	CACGATGATACAGATCAGCAAGAGA	3290
305	CUCUUGCUGAUCUGUAUCAUCGUGA	2687	TCACGATGATACAGATCAGCAAGAG	3291
306	UCUUGCUGAUCUGUAUCAUCGUGAU	2688	ATCACGATGATACAGATCAGCAAGA	3292
307	CUUGCUGAUCUGUAUCAUCGUGAUG	2689	CATCACGATGATACAGATCAGCAAG	3293
308	UUGCUGAUCUGUAUCAUCGUGAUGC	2690	GCATCACGATGATACAGATCAGCAA	3294
309	UGCUGAUCUGUAUCAUCGUGAUGCU	2691	AGCATCACGATGATACAGATCAGCA	3295
310	GCUGAUCUGUAUCAUCGUGAUGCUU	2692	AAGCATCACGATGATACAGATCAGC	3296
311	CUGAUCUGUAUCAUCGUGAUGCUUC	2693	GAAGCATCACGATGATACAGATCAG	3297
312	UGAUCUGUAUCAUCGUGAUGCUUCU	2694	AGAAGCATCACGATGATACAGATCA	3298
313	GAUCUGUAUCAUCGUGAUGCUUCUC	2695	GAGAAGCATCACGATGATACAGATC	3299
314	AUCUGUAUCAUCGUGAUGCUUCUCU	2696	AGAGAAGCATCACGATGATACAGAT	3300
315	UCUGUAUCAUCGUGAUGCUUCUCUG	2697	CAGAGAAGCATCACGATGATACAGA	3301
316	CUGUAUCAUCGUGAUGCUUCUCUGA	2698	TCAGAGAAGCATCACGATGATACAG	3302
317	UGUAUCAUCGUGAUGCUUCUCUGAA	2699	TTCAGAGAAGCATCACGATGATACA	3303
318	GUAUCAUCGUGAUGCUUCUCUGAAG	2700	CTTCAGAGAAGCATCACGATGATAC	3304
319	UAUCAUCGUGAUGCUUCUCUGAAGU	2701	ACTTCAGAGAAGCATCACGATGATA	3305
320	AUCAUCGUGAUGCUUCUCUGAAGUU	2702	AACTTCAGAGAAGCATCACGATGAT	3306
321	UCAUCGUGAUGCUUCUCUGAAGUUC	2703	GAACTTCAGAGAAGCATCACGATGA	3307
322	CAUCGUGAUGCUUCUCUGAAGUUCU	2704	AGAACTTCAGAGAAGCATCACGATG	3308
323	AUCGUGAUGCUUCUCUGAAGUUCUG	2705	CAGAACTTCAGAGAAGCATCACGAT	3309
324	UCGUGAUGCUUCUCUGAAGUUCUGC	2706	GCAGAACTTCAGAGAAGCATCACGA	3310
325	CGUGAUGCUUCUCUGAAGUUCUGCU	2707	AGCAGAACTTCAGAGAAGCATCACG	3311
326	GUGAUGCUUCUCUGAAGUUCUGCUA	2708	TAGCAGAACTTCAGAGAAGCATCAC	3312
327	UGAUGCUUCUCUGAAGUUCUGCUAC	2709	GTAGCAGAACTTCAGAGAAGCATCA	3313
328	GAUGCUUCUCUGAAGUUCUGCUACA	2710	TGTAGCAGAACTTCAGAGAAGCATC	3314
329	AUGCUUCUCUGAAGUUCUGCUACAA	2711	TTGTAGCAGAACTTCAGAGAAGCAT	3315
330	UGCUUCUCUGAAGUUCUGCUACAAC	2712	GTTGTAGCAGAACTTCAGAGAAGCA	3316
331	GCUUCUCUGAAGUUCUGCUACAACC	2713	GGTTGTAGCAGAACTTCAGAGAAGC	3317
332	CUUCUCUGAAGUUCUGCUACAACCU	2714	AGGTTGTAGCAGAACTTCAGAGAAG	3318
333	UUCUCUGAAGUUCUGCUACAACCUC	2715	GAGGTTGTAGCAGAACTTCAGAGAA	3319
334	UCUCUGAAGUUCUGCUACAACCUCU	2716	AGAGGTTGTAGCAGAACTTCAGAGA	3320
335	CUCUGAAGUUCUGCUACAACCUCUA	2717	TAGAGGTTGTAGCAGAACTTCAGAG	3321
336	UCUGAAGUUCUGCUACAACCUCUAG	2718	CTAGAGGTTGTAGCAGAACTTCAGA	3322
337	CUGAAGUUCUGCUACAACCUCUAGA	2719	TCTAGAGGTTGTAGCAGAACTTCAG	3323
338	UGAAGUUCUGCUACAACCUCUAGAU	2720	ATCTAGAGGTTGTAGCAGAACTTCA	3324
339	GAAGUUCUGCUACAACCUCUAGAUC	2721	GATCTAGAGGTTGTAGCAGAACTTC	3325
340	AAGUUCUGCUACAACCUCUAGAUCU	2722	AGATCTAGAGGTTGTAGCAGAACTT	3326
341	AGUUCUGCUACAACCUCUAGAUCUG	2723	CAGATCTAGAGGTTGTAGCAGAACT	3327
342	GUUCUGCUACAACCUCUAGAUCUGC	2724	GCAGATCTAGAGGTTGTAGCAGAAC	3328
343	UUCUGCUACAACCUCUAGAUCUGCA	2725	TGCAGATCTAGAGGTTGTAGCAGAA	3329

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344	UCUGCUACAACCUCUAGAUCUGCAG	2726	CTGCAGATCTAGAGGTTGTAGCAGA	3330
345	CUGCUACAACCUCUAGAUCUGCAGC	2727	GCTGCAGATCTAGAGGTTGTAGCAG	3331
346	UGCUACAACCUCUAGAUCUGCAGCU	2728	AGCTGCAGATCTAGAGGTTGTAGCA	3332
347	GCUACAACCUCUAGAUCUGCAGCUU	2729	AAGCTGCAGATCTAGAGGTTGTAGC	3333
348	CUACAACCUCUAGAUCUGCAGCUUG	2730	CAAGCTGCAGATCTAGAGGTTGTAG	3334
349	UACAACCUCUAGAUCUGCAGCUUGC	2731	GCAAGCTGCAGATCTAGAGGTTGTA	3335
350	ACAACCUCUAGAUCUGCAGCUUGCC	2732	GGCAAGCTGCAGATCTAGAGGTTGT	3336
351	CAACCUCUAGAUCUGCAGCUUGCCA	2733	TGGCAAGCTGCAGATCTAGAGGTTG	3337
352	AACCUCUAGAUCUGCAGCUUGCCAC	2734	GTGGCAAGCTGCAGATCTAGAGGTT	3338
353	ACCUCUAGAUCUGCAGCUUGCCACA	2735	TGTGGCAAGCTGCAGATCTAGAGGT	3339
354	CCUCUAGAUCUGCAGCUUGCCACAU	2736	ATGTGGCAAGCTGCAGATCTAGAGG	3340
355	CUCUAGAUCUGCAGCUUGCCACAUC	2737	GATGTGGCAAGCTGCAGATCTAGAG	3341
356	UCUAGAUCUGCAGCUUGCCACAUCA	2738	TGATGTGGCAAGCTGCAGATCTAGA	3342
357	CUAGAUCUGCAGCUUGCCACAUCAG	2739	CTGATGTGGCAAGCTGCAGATCTAG	3343
358	UAGAUCUGCAGCUUGCCACAUCAGC	2740	GCTGATGTGGCAAGCTGCAGATCTA	3344
368	GCUUGCCACAUCAGCUUAAAAUCUG	2741	CAGATTTTAAGCTGATGTGGCAAGC	3345
369	CUUGCCACAUCAGCUUAAAAUCUGU	2742	ACAGATTTTAAGCTGATGTGGCAAG	3346
370	UUGCCACAUCAGCUUAAAAUCUGUC	2743	GACAGATTTTAAGCTGATGTGGCAA	3347
371	UGCCACAUCAGCUUAAAAUCUGUCA	2744	TGACAGATTTTAAGCTGATGTGGCA	3348
372	GCCACAUCAGCUUAAAAUCUGUCAU	2745	ATGACAGATTTTAAGCTGATGTGGC	3349
373	CCACAUCAGCUUAAAAUCUGUCAUC	2746	GATGACAGATTTTAAGCTGATGTGG	3350
374	CACAUCAGCUUAAAAUCUGUCAUCC	2747	GGATGACAGATTTTAAGCTGATGTG	3351
375	ACAUCAGCUUAAAAUCUGUCAUCCC	2748	GGGATGACAGATTTTAAGCTGATGT	3352
376	CAUCAGCUUAAAAUCUGUCAUCCCA	2749	TGGGATGACAGATTTTAAGCTGATG	3353
377	AUCAGCUUAAAAUCUGUCAUCCCAU	2750	ATGGGATGACAGATTTTAAGCTGAT	3354
378	UCAGCUUAAAAUCUGUCAUCCCAUG	2751	CATGGGATGACAGATTTTAAGCTGA	3355
379	CAGCUUAAAAUCUGUCAUCCCAUGC	2752	GCATGGGATGACAGATTTTAAGCTG	3356
380	AGCUUAAAAUCUGUCAUCCCAUGCA	2753	TGCATGGGATGACAGATTTTAAGCT	3357
381	GCUUAAAAUCUGUCAUCCCAUGCAG	2754	CTGCATGGGATGACAGATTTTAAGC	3358
382	CUUAAAAUCUGUCAUCCCAUGCAGA	2755	TCTGCATGGGATGACAGATTTTAAG	3359
383	UUAAAAUCUGUCAUCCCAUGCAGAC	2756	GTCTGCATGGGATGACAGATTTTAA	3360
384	UAAAAUCUGUCAUCCCAUGCAGACA	2757	TGTCTGCATGGGATGACAGATTTTA	3361
391	UGUCAUCCCAUGCAGACAGGAAAAC	2758	GTTTTCCTGTCTGCATGGGATGACA	3362
392	GUCAUCCCAUGCAGACAGGAAAACA	2759	TGTTTTCCTGTCTGCATGGGATGAC	3363
393	UCAUCCCAUGCAGACAGGAAAACAA	2760	TTGTTTTCCTGTCTGCATGGGATGA	3364
394	CAUCCCAUGCAGACAGGAAAACAAU	2761	ATTGTTTTCCTGTCTGCATGGGATG	3365
395	AUCCCAUGCAGACAGGAAAACAAUA	2762	TATTGTTTTCCTGTCTGCATGGGAT	3366
396	UCCCAUGCAGACAGGAAAACAAUAU	2763	ATATTGTTTTCCTGTCTGCATGGGA	3367
397	CCCAUGCAGACAGGAAAACAAUAUU	2764	AATATTGTTTTCCTGTCTGCATGGG	3368
398	CCAUGCAGACAGGAAAACAAUAUUG	2765	CAATATTGTTTTCCTGTCTGCATGG	3369
399	CAUGCAGACAGGAAAACAAUAUUGU	2766	ACAATATTGTTTTCCTGTCTGCATG	3370
400	AUGCAGACAGGAAAACAAUAUUGUA	2767	TACAATATTGTTTTCCTGTCTGCAT	3371
401	UGCAGACAGGAAAACAAUAUUGUAU	2768	ATACAATATTGTTTTCCTGTCTGCA	3372
426	AACAGACCACUUCCUGAGUAGAAGA	2769	TCTTCTACTCAGGAAGTGGTCTGTT	3373
427	ACAGACCACUUCCUGAGUAGAAGAG	2770	CTCTTCTACTCAGGAAGTGGTCTGT	3374
428	CAGACCACUUCCUGAGUAGAAGAGU	2771	ACTCTTCTACTCAGGAAGTGGTCTG	3375
430	GACCACUUCCUGAGUAGAAGAGUUU	2772	AAACTCTTCTACTCAGGAAGTGGTC	3376

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431	ACCACUUCCUGAGUAGAAGAGUUUC	2773	GAAACTCTTCTACTCAGGAAGTGGT	3377
432	CCACUUCCUGAGUAGAAGAGUUUCU	2774	AGAAACTCTTCTACTCAGGAAGTGG	3378
445	AGAAGAGUUUCUUUGUGAAAAGGUC	2775	GACCTTTTCACAAAGAAACTCTTCT	3379
446	GAAGAGUUUCUUUGUGAAAAGGUCA	2776	TGACCTTTTCACAAAGAAACTCTTC	3380
447	AAGAGUUUCUUUGUGAAAAGGUCAA	2777	TTGACCTTTTCACAAAGAAACTCTT	3381
448	AGAGUUUCUUUGUGAAAAGGUCAAG	2778	CTTGACCTTTTCACAAAGAAACTCT	3382
449	GAGUUUCUUUGUGAAAAGGUCAAGA	2779	TCTTGACCTTTTCACAAAGAAACTC	3383
450	AGUUUCUUUGUGAAAAGGUCAAGAU	2780	ATCTTGACCTTTTCACAAAGAAACT	3384
451	GUUUCUUUGUGAAAAGGUCAAGAUU	2781	AATCTTGACCTTTTCACAAAGAAAC	3385
452	UUUCUUUGUGAAAAGGUCAAGAUUA	2782	TAATCTTGACCTTTTCACAAAGAAA	3386
453	UUCUUUGUGAAAAGGUCAAGAUUAA	2783	TTAATCTTGACCTTTTCACAAAGAA	3387
504	AUUCAUCUGUUGGAUCUUGUAAACA	2784	TGTTTACAAGATCCAACAGATGAAT	3388
505	UUCAUCUGUUGGAUCUUGUAAACAU	2785	ATGTTTACAAGATCCAACAGATGAA	3389
506	UCAUCUGUUGGAUCUUGUAAACAUG	2786	CATGTTTACAAGATCCAACAGATGA	3390
507	CAUCUGUUGGAUCUUGUAAACAUGA	2787	TCATGTTTACAAGATCCAACAGATG	3391
508	AUCUGUUGGAUCUUGUAAACAUGAA	2788	TTCATGTTTACAAGATCCAACAGAT	3392
509	UCUGUUGGAUCUUGUAAACAUGAAA	2789	TTTCATGTTTACAAGATCCAACAGA	3393
510	CUGUUGGAUCUUGUAAACAUGAAAA	2790	TTTTCATGTTTACAAGATCCAACAG	3394
511	UGUUGGAUCUUGUAAACAUGAAAAG	2791	CTTTTCATGTTTACAAGATCCAACA	3395
512	GUUGGAUCUUGUAAACAUGAAAAGG	2792	CCTTTTCATGTTTACAAGATCCAAC	3396
513	UUGGAUCUUGUAAACAUGAAAAGGG	2793	CCCTTTTCATGTTTACAAGATCCAA	3397
514	UGGAUCUUGUAAACAUGAAAAGGGC	2794	GCCCTTTTCATGTTTACAAGATCCA	3398
515	GGAUCUUGUAAACAUGAAAAGGGCU	2795	AGCCCTTTTCATGTTTACAAGATCC	3399
516	GAUCUUGUAAACAUGAAAAGGGCUU	2796	AAGCCCTTTTCATGTTTACAAGATC	3400
517	AUCUUGUAAACAUGAAAAGGGCUUU	2797	AAAGCCCTTTTCATGTTTACAAGAT	3401
518	UCUUGUAAACAUGAAAAGGGCUUUA	2798	TAAAGCCCTTTTCATGTTTACAAGA	3402
519	CUUGUAAACAUGAAAAGGGCUUUAU	2799	ATAAAGCCCTTTTCATGTTTACAAG	3403
520	UUGUAAACAUGAAAAGGGCUUUAUU	2800	AATAAAGCCCTTTTCATGTTTACAA	3404
521	UGUAAACAUGAAAAGGGCUUUAUUU	2801	AAATAAAGCCCTTTTCATGTTTACA	3405
522	GUAAACAUGAAAAGGGCUUUAUUUU	2802	AAAATAAAGCCCTTTTCATGTTTAC	3406
531	AAAAGGGCUUUAUUUUCAAAAAUUA	2803	TAATTTTTGAAAATAAAGCCCTTTT	3407
532	AAAGGGCUUUAUUUUCAAAAAUUAA	2804	TTAATTTTTGAAAATAAAGCCCTTT	3408
533	AAGGGCUUUAUUUUCAAAAAUUAAC	2805	GTTAATTTTTGAAAATAAAGCCCTT	3409
534	AGGGCUUUAUUUUCAAAAAUUAACU	2806	AGTTAATTTTTGAAAATAAAGCCCT	3410
535	GGGCUUUAUUUUCAAAAAUUAACUU	2807	AAGTTAATTTTTGAAAATAAAGCCC	3411
570	GUAUAAAAUGCAACUGUUGAUUUCC	2808	GGAAATCAACAGTTGCATTTTATAC	3412
571	UAUAAAAUGCAACUGUUGAUUUCCU	2809	AGGAAATCAACAGTTGCATTTTATA	3413
572	AUAAAAUGCAACUGUUGAUUUCCUC	2810	GAGGAAATCAACAGTTGCATTTTAT	3414
573	UAAAAUGCAACUGUUGAUUUCCUCA	2811	TGAGGAAATCAACAGTTGCATTTTA	3415
574	AAAAUGCAACUGUUGAUUUCCUCAA	2812	TTGAGGAAATCAACAGTTGCATTTT	3416
586	UUGAUUUCCUCAACAUGGCUCACAA	2813	TTGTGAGCCATGTTGAGGAAATCAA	3417
587	UGAUUUCCUCAACAUGGCUCACAAA	2814	TTTGTGAGCCATGTTGAGGAAATCA	3418
588	GAUUUCCUCAACAUGGCUCACAAAU	2815	ATTTGTGAGCCATGTTGAGGAAATC	3419
589	AUUUCCUCAACAUGGCUCACAAAUU	2816	AATTTGTGAGCCATGTTGAGGAAAT	3420
590	UUUCCUCAACAUGGCUCACAAAUUU	2817	AAATTTGTGAGCCATGTTGAGGAAA	3421
591	UUCCUCAACAUGGCUCACAAAUUUC	2818	GAAATTTGTGAGCCATGTTGAGGAA	3422
592	UCCUCAACAUGGCUCACAAAUUUCU	2819	AGAAATTTGTGAGCCATGTTGAGGA	3423

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593	CCUCAACAUGGCUCACAAAUUUCUA	2820	TAGAAATTTGTGAGCCATGTTGAGG	3424
594	CUCAACAUGGCUCACAAAUUUCUAU	2821	ATAGAAATTTGTGAGCCATGTTGAG	3425
595	UCAACAUGGCUCACAAAUUUCUAUC	2822	GATAGAAATTTGTGAGCCATGTTGA	3426
596	CAACAUGGCUCACAAAUUUCUAUCC	2823	GGATAGAAATTTGTGAGCCATGTTG	3427
597	AACAUGGCUCACAAAUUUCUAUCCC	2824	GGGATAGAAATTTGTGAGCCATGTT	3428
598	ACAUGGCUCACAAAUUUCUAUCCCA	2825	TGGGATAGAAATTTGTGAGCCATGT	3429
599	CAUGGCUCACAAAUUUCUAUCCCAA	2826	TTGGGATAGAAATTTGTGAGCCATG	3430
600	AUGGCUCACAAAUUUCUAUCCCAAA	2827	TTTGGGATAGAAATTTGTGAGCCAT	3431
601	UGGCUCACAAAUUUCUAUCCCAAAU	2828	ATTTGGGATAGAAATTTGTGAGCCA	3432
602	GGCUCACAAAUUUCUAUCCCAAAUC	2829	GATTTGGGATAGAAATTTGTGAGCC	3433
603	GCUCACAAAUUUCUAUCCCAAAUCU	2830	AGATTTGGGATAGAAATTTGTGAGC	3434
604	CUCACAAAUUUCUAUCCCAAAUCUU	2831	AAGATTTGGGATAGAAATTTGTGAG	3435
605	UCACAAAUUUCUAUCCCAAAUCUUU	2832	AAAGATTTGGGATAGAAATTTGTGA	3436
606	CACAAAUUUCUAUCCCAAAUCUUUU	2833	AAAAGATTTGGGATAGAAATTTGTG	3437
607	ACAAAUUUCUAUCCCAAAUCUUUUC	2834	GAAAAGATTTGGGATAGAAATTTGT	3438
608	CAAAUUUCUAUCCCAAAUCUUUUCU	2835	AGAAAAGATTTGGGATAGAAATTTG	3439
609	AAAUUUCUAUCCCAAAUCUUUUCUG	2836	CAGAAAAGATTTGGGATAGAAATTT	3440
610	AAUUUCUAUCCCAAAUCUUUUCUGA	2837	TCAGAAAAGATTTGGGATAGAAATT	3441
611	AUUUCUAUCCCAAAUCUUUUCUGAA	2838	TTCAGAAAAGATTTGGGATAGAAAT	3442
612	UUUCUAUCCCAAAUCUUUUCUGAAG	2839	CTTCAGAAAAGATTTGGGATAGAAA	3443
613	UUCUAUCCCAAAUCUUUUCUGAAGA	2840	TCTTCAGAAAAGATTTGGGATAGAA	3444
644	GUUUAGUUUUAAAACUGCACUGCCA	2841	TGGCAGTGCAGTTTTAAAACTAAAC	3445
645	UUUAGUUUUAAAACUGCACUGCCAA	2842	TTGGCAGTGCAGTTTTAAAACTAAA	3446
646	UUAGUUUUAAAACUGCACUGCCAAC	2843	GTTGGCAGTGCAGTTTTAAAACTAA	3447
647	UAGUUUUAAAACUGCACUGCCAACA	2844	TGTTGGCAGTGCAGTTTTAAAACTA	3448
648	AGUUUUAAAACUGCACUGCCAACAA	2845	TTGTTGGCAGTGCAGTTTTAAAACT	3449
649	GUUUUAAAACUGCACUGCCAACAAG	2846	CTTGTTGGCAGTGCAGTTTTAAAAC	3450
650	UUUUAAAACUGCACUGCCAACAAGU	2847	ACTTGTTGGCAGTGCAGTTTTAAAA	3451
651	UUUAAAACUGCACUGCCAACAAGUU	2848	AACTTGTTGGCAGTGCAGTTTTAAA	3452
652	UUAAAACUGCACUGCCAACAAGUUC	2849	GAACTTGTTGGCAGTGCAGTTTTAA	3453
653	UAAAACUGCACUGCCAACAAGUUCA	2850	TGAACTTGTTGGCAGTGCAGTTTTA	3454
654	AAAACUGCACUGCCAACAAGUUCAC	2851	GTGAACTTGTTGGCAGTGCAGTTTT	3455
655	AAACUGCACUGCCAACAAGUUCACU	2852	AGTGAACTTGTTGGCAGTGCAGTTT	3456
656	AACUGCACUGCCAACAAGUUCACUU	2853	AAGTGAACTTGTTGGCAGTGCAGTT	3457
657	ACUGCACUGCCAACAAGUUCACUUC	2854	GAAGTGAACTTGTTGGCAGTGCAGT	3458
658	CUGCACUGCCAACAAGUUCACUUCA	2855	TGAAGTGAACTTGTTGGCAGTGCAG	3459
659	UGCACUGCCAACAAGUUCACUUCAU	2856	ATGAAGTGAACTTGTTGGCAGTGCA	3460
660	GCACUGCCAACAAGUUCACUUCAUA	2857	TATGAAGTGAACTTGTTGGCAGTGC	3461
661	CACUGCCAACAAGUUCACUUCAUAU	2858	ATATGAAGTGAACTTGTTGGCAGTG	3462
662	ACUGCCAACAAGUUCACUUCAUAUA	2859	TATATGAAGTGAACTTGTTGGCAGT	3463
663	CUGCCAACAAGUUCACUUCAUAUAU	2860	ATATATGAAGTGAACTTGTTGGCAG	3464
755	UAAGUAUUUUUCAGGUCUUCACCAA	2861	TTGGTGAAGACCTGAAAAATACTTA	3465
756	AAGUAUUUUUCAGGUCUUCACCAAG	2862	CTTGGTGAAGACCTGAAAAATACTT	3466
757	AGUAUUUUUCAGGUCUUCACCAAGU	2863	ACTTGGTGAAGACCTGAAAAATACT	3467
760	AUUUUUCAGGUCUUCACCAAGUAUC	2864	GATACTTGGTGAAGACCTGAAAAAT	3468
761	UUUUUCAGGUCUUCACCAAGUAUCA	2865	TGATACTTGGTGAAGACCTGAAAAA	3469
762	UUUUCAGGUCUUCACCAAGUAUCAA	2866	TTGATACTTGGTGAAGACCTGAAAA	3470

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763	UUUCAGGUCUUCACCAAGUAUCAAA	2867	TTTGATACTTGGTGAAGACCTGAAA	3471
764	UUCAGGUCUUCACCAAGUAUCAAAG	2868	CTTTGATACTTGGTGAAGACCTGAA	3472
765	UCAGGUCUUCACCAAGUAUCAAAGU	2869	ACTTTGATACTTGGTGAAGACCTGA	3473
766	CAGGUCUUCACCAAGUAUCAAAGUA	2870	TACTTTGATACTTGGTGAAGACCTG	3474
813	AUUCAAAAUAGUCCACUGACUCCUC	2871	GAGGAGTCAGTGGACTATTTTGAAT	3475
814	UUCAAAAUAGUCCACUGACUCCUCA	2872	TGAGGAGTCAGTGGACTATTTTGAA	3476
815	UCAAAAUAGUCCACUGACUCCUCAC	2873	GTGAGGAGTCAGTGGACTATTTTGA	3477
816	CAAAAUAGUCCACUGACUCCUCACA	2874	TGTGAGGAGTCAGTGGACTATTTTG	3478
817	AAAAUAGUCCACUGACUCCUCACAU	2875	ATGTGAGGAGTCAGTGGACTATTTT	3479
818	AAAUAGUCCACUGACUCCUCACAUC	2876	GATGTGAGGAGTCAGTGGACTATTT	3480
819	AAUAGUCCACUGACUCCUCACAUCU	2877	AGATGTGAGGAGTCAGTGGACTATT	3481
820	AUAGUCCACUGACUCCUCACAUCUG	2878	CAGATGTGAGGAGTCAGTGGACTAT	3482
821	UAGUCCACUGACUCCUCACAUCUGU	2879	ACAGATGTGAGGAGTCAGTGGACTA	3483
822	AGUCCACUGACUCCUCACAUCUGUU	2880	AACAGATGTGAGGAGTCAGTGGACT	3484
823	GUCCACUGACUCCUCACAUCUGUUA	2881	TAACAGATGTGAGGAGTCAGTGGAC	3485
824	UCCACUGACUCCUCACAUCUGUUAU	2882	ATAACAGATGTGAGGAGTCAGTGGA	3486
825	CCACUGACUCCUCACAUCUGUUAUC	2883	GATAACAGATGTGAGGAGTCAGTGG	3487
911	UUUUUCUAUGCCACAUUAACAUCUU	2884	AAGATGTTAATGTGGCATAGAAAAA	3488
912	UUUUCUAUGCCACAUUAACAUCUUU	2885	AAAGATGTTAATGTGGCATAGAAAA	3489
913	UUUCUAUGCCACAUUAACAUCUUUU	2886	AAAAGATGTTAATGTGGCATAGAAA	3490
919	UGCCACAUUAACAUCUUUUAAAGUU	2887	AACTTTAAAAGATGTTAATGTGGCA	3491
920	GCCACAUUAACAUCUUUUAAAGUUG	2888	CAACTTTAAAAGATGTTAATGTGGC	3492
948	AGAAUCAAGUAUGGAAAAGUAAGGC	2889	GCCTTACTTTTCCATACTTGATTCT	3493
949	GAAUCAAGUAUGGAAAAGUAAGGCC	2890	GGCCTTACTTTTCCATACTTGATTC	3494
950	AAUCAAGUAUGGAAAAGUAAGGCCA	2891	TGGCCTTACTTTTCCATACTTGATT	3495
959	UGGAAAAGUAAGGCCAUACUCUUAC	2892	GTAAGAGTATGGCCTTACTTTTCCA	3496
960	GGAAAAGUAAGGCCAUACUCUUACA	2893	TGTAAGAGTATGGCCTTACTTTTCC	3497
1067	CAUAUGAUCAACAGAUGAGAACUGG	2894	CCAGTTCTCATCTGTTGATCATATG	3498
1069	UAUGAUCAACAGAUGAGAACUGGUG	2895	CACCAGTTCTCATCTGTTGATCATA	3499
1070	AUGAUCAACAGAUGAGAACUGGUGG	2896	CCACCAGTTCTCATCTGTTGATCAT	3500
1071	UGAUCAACAGAUGAGAACUGGUGGU	2897	ACCACCAGTTCTCATCTGTTGATCA	3501
1072	GAUCAACAGAUGAGAACUGGUGGUU	2898	AACCACCAGTTCTCATCTGTTGATC	3502
1073	AUCAACAGAUGAGAACUGGUGGUUA	2899	TAACCACCAGTTCTCATCTGTTGAT	3503
1074	UCAACAGAUGAGAACUGGUGGUUAA	2900	TTAACCACCAGTTCTCATCTGTTGA	3504
1075	CAACAGAUGAGAACUGGUGGUUAAU	2901	ATTAACCACCAGTTCTCATCTGTTG	3505
1078	CAGAUGAGAACUGGUGGUUAAUAUG	2902	CATATTAACCACCAGTTCTCATCTG	3506
1080	GAUGAGAACUGGUGGUUAAUAUGUG	2903	CACATATTAACCACCAGTTCTCATC	3507
1081	AUGAGAACUGGUGGUUAAUAUGUGA	2904	TCACATATTAACCACCAGTTCTCAT	3508
1082	UGAGAACUGGUGGUUAAUAUGUGAC	2905	GTCACATATTAACCACCAGTTCTCA	3509
1083	GAGAACUGGUGGUUAAUAUGUGACA	2906	TGTCACATATTAACCACCAGTTCTC	3510
1086	AACUGGUGGUUAAUAUGUGACAGUG	2907	CACTGTCACATATTAACCACCAGTT	3511
1087	ACUGGUGGUUAAUAUGUGACAGUGA	2908	TCACTGTCACATATTAACCACCAGT	3512
1088	CUGGUGGUUAAUAUGUGACAGUGAG	2909	CTCACTGTCACATATTAACCACCAG	3513
1089	UGGUGGUUAAUAUGUGACAGUGAGA	2910	TCTCACTGTCACATATTAACCACCA	3514
1141	CAGAAUCUAAUCUUCAUUUAAGGCA	2911	TGCCTTAAATGAAGATTAGATTCTG	3515
1150	AUCUUCAUUUAAGGCACUGUAGUGA	2912	TCACTACAGTGCCTTAAATGAAGAT	3516
1151	UCUUCAUUUAAGGCACUGUAGUGAA	2913	TTCACTACAGTGCCTTAAATGAAGA	3517

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1153	UUCAUUUAAGGCACUGUAGUGAAUU	2914	AATTCACTACAGTGCCTTAAATGAA	3518
1161	AGGCACUGUAGUGAAUUAUCUGAGC	2915	GCTCAGATAATTCACTACAGTGCCT	3519
1162	GGCACUGUAGUGAAUUAUCUGAGCU	2916	AGCTCAGATAATTCACTACAGTGCC	3520
1211	UAUCUUUGGAAUCAUGAAACCUUAA	2917	TTAAGGTTTCATGATTCCAAAGATA	3521
1212	AUCUUUGGAAUCAUGAAACCUUAAG	2918	CTTAAGGTTTCATGATTCCAAAGAT	3522
1213	UCUUUGGAAUCAUGAAACCUUAAGA	2919	TCTTAAGGTTTCATGATTCCAAAGA	3523
1214	CUUUGGAAUCAUGAAACCUUAAGAC	2920	GTCTTAAGGTTTCATGATTCCAAAG	3524
1215	UUUGGAAUCAUGAAACCUUAAGACU	2921	AGTCTTAAGGTTTCATGATTCCAAA	3525
1216	UUGGAAUCAUGAAACCUUAAGACUU	2922	AAGTCTTAAGGTTTCATGATTCCAA	3526
1217	UGGAAUCAUGAAACCUUAAGACUUC	2923	GAAGTCTTAAGGTTTCATGATTCCA	3527
1218	GGAAUCAUGAAACCUUAAGACUUCA	2924	TGAAGTCTTAAGGTTTCATGATTCC	3528
1223	CAUGAAACCUUAAGACUUCAGAAUG	2925	CATTCTGAAGTCTTAAGGTTTCATG	3529
1230	CCUUAAGACUUCAGAAUGAUUUUGC	2926	GCAAAATCATTCTGAAGTCTTAAGG	3530
1231	CUUAAGACUUCAGAAUGAUUUUGCA	2927	TGCAAAATCATTCTGAAGTCTTAAG	3531
1232	UUAAGACUUCAGAAUGAUUUUGCAG	2928	CTGCAAAATCATTCTGAAGTCTTAA	3532
1233	UAAGACUUCAGAAUGAUUUUGCAGG	2929	CCTGCAAAATCATTCTGAAGTCTTA	3533
1234	AAGACUUCAGAAUGAUUUUGCAGGU	2930	ACCTGCAAAATCATTCTGAAGTCTT	3534
1235	AGACUUCAGAAUGAUUUUGCAGGUU	2931	AACCTGCAAAATCATTCTGAAGTCT	3535
1236	GACUUCAGAAUGAUUUUGCAGGUUG	2932	CAACCTGCAAAATCATTCTGAAGTC	3536
1237	ACUUCAGAAUGAUUUUGCAGGUUGU	2933	ACAACCTGCAAAATCATTCTGAAGT	3537
1238	CUUCAGAAUGAUUUUGCAGGUUGUC	2934	GACAACCTGCAAAATCATTCTGAAG	3538
1239	UUCAGAAUGAUUUUGCAGGUUGUCU	2935	AGACAACCTGCAAAATCATTCTGAA	3539
1240	UCAGAAUGAUUUUGCAGGUUGUCUU	2936	AAGACAACCTGCAAAATCATTCTGA	3540
1241	CAGAAUGAUUUUGCAGGUUGUCUUC	2937	GAAGACAACCTGCAAAATCATTCTG	3541
1242	AGAAUGAUUUUGCAGGUUGUCUUCC	2938	GGAAGACAACCTGCAAAATCATTCT	3542
1243	GAAUGAUUUUGCAGGUUGUCUUCCA	2939	TGGAAGACAACCTGCAAAATCATTC	3543
1244	AAUGAUUUUGCAGGUUGUCUUCCAU	2940	ATGGAAGACAACCTGCAAAATCATT	3544
1245	AUGAUUUUGCAGGUUGUCUUCCAUU	2941	AATGGAAGACAACCTGCAAAATCAT	3545
1246	UGAUUUUGCAGGUUGUCUUCCAUUC	2942	GAATGGAAGACAACCTGCAAAATCA	3546
1247	GAUUUUGCAGGUUGUCUUCCAUUCC	2943	GGAATGGAAGACAACCTGCAAAATC	3547
1248	AUUUUGCAGGUUGUCUUCCAUUCCA	2944	TGGAATGGAAGACAACCTGCAAAAT	3548
1249	UUUUGCAGGUUGUCUUCCAUUCCAG	2945	CTGGAATGGAAGACAACCTGCAAAA	3549
1250	UUUGCAGGUUGUCUUCCAUUCCAGC	2946	GCTGGAATGGAAGACAACCTGCAAA	3550
1251	UUGCAGGUUGUCUUCCAUUCCAGCC	2947	GGCTGGAATGGAAGACAACCTGCAA	3551
1252	UGCAGGUUGUCUUCCAUUCCAGCCU	2948	AGGCTGGAATGGAAGACAACCTGCA	3552
1253	GCAGGUUGUCUUCCAUUCCAGCCUA	2949	TAGGCTGGAATGGAAGACAACCTGC	3553
1254	CAGGUUGUCUUCCAUUCCAGCCUAA	2950	TTAGGCTGGAATGGAAGACAACCTG	3554
1255	AGGUUGUCUUCCAUUCCAGCCUAAC	2951	GTTAGGCTGGAATGGAAGACAACCT	3555
1256	GGUUGUCUUCCAUUCCAGCCUAACA	2952	TGTTAGGCTGGAATGGAAGACAACC	3556
1257	GUUGUCUUCCAUUCCAGCCUAACAU	2953	ATGTTAGGCTGGAATGGAAGACAAC	3557
1258	UUGUCUUCCAUUCCAGCCUAACAUC	2954	GATGTTAGGCTGGAATGGAAGACAA	3558
1259	UGUCUUCCAUUCCAGCCUAACAUCC	2955	GGATGTTAGGCTGGAATGGAAGACA	3559
1260	GUCUUCCAUUCCAGCCUAACAUCCA	2956	TGGATGTTAGGCTGGAATGGAAGAC	3560
1261	UCUUCCAUUCCAGCCUAACAUCCAA	2957	TTGGATGTTAGGCTGGAATGGAAGA	3561
1262	CUUCCAUUCCAGCCUAACAUCCAAU	2958	ATTGGATGTTAGGCTGGAATGGAAG	3562
1263	UUCCAUUCCAGCCUAACAUCCAAUG	2959	CATTGGATGTTAGGCTGGAATGGAA	3563
1264	UCCAUUCCAGCCUAACAUCCAAUGC	2960	GCATTGGATGTTAGGCTGGAATGGA	3564

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1265	CCAUUCCAGCCUAACAUCCAAUGCA	2961	TGCATTGGATGTTAGGCTGGAATGG	3565
1266	CAUUCCAGCCUAACAUCCAAUGCAG	2962	CTGCATTGGATGTTAGGCTGGAATG	3566
1267	AUUCCAGCCUAACAUCCAAUGCAGG	2963	CCTGCATTGGATGTTAGGCTGGAAT	3567
1274	CCUAACAUCCAAUGCAGGCAAGGAA	2964	TTCCTTGCCTGCATTGGATGTTAGG	3568
1275	CUAACAUCCAAUGCAGGCAAGGAAA	2965	TTTCCTTGCCTGCATTGGATGTTAG	3569
1276	UAACAUCCAAUGCAGGCAAGGAAAA	2966	TTTTCCTTGCCTGCATTGGATGTTA	3570
1277	AACAUCCAAUGCAGGCAAGGAAAAU	2967	ATTTTCCTTGCCTGCATTGGATGTT	3571
1278	ACAUCCAAUGCAGGCAAGGAAAAUA	2968	TATTTTCCTTGCCTGCATTGGATGT	3572
1279	CAUCCAAUGCAGGCAAGGAAAAUAA	2969	TTATTTTCCTTGCCTGCATTGGATG	3573
1280	AUCCAAUGCAGGCAAGGAAAAUAAA	2970	TTTATTTTCCTTGCCTGCATTGGAT	3574
1281	UCCAAUGCAGGCAAGGAAAAUAAAA	2971	TTTTATTTTCCTTGCCTGCATTGGA	3575
1282	CCAAUGCAGGCAAGGAAAAUAAAAG	2972	CTTTTATTTTCCTTGCCTGCATTGG	3576
1283	CAAUGCAGGCAAGGAAAAUAAAAGA	2973	TCTTTTATTTTCCTTGCCTGCATTG	3577
1284	AAUGCAGGCAAGGAAAAUAAAAGAU	2974	ATCTTTTATTTTCCTTGCCTGCATT	3578
1285	AUGCAGGCAAGGAAAAUAAAAGAUU	2975	AATCTTTTATTTTCCTTGCCTGCAT	3579
1286	UGCAGGCAAGGAAAAUAAAAGAUUU	2976	AAATCTTTTATTTTCCTTGCCTGCA	3580
1287	GCAGGCAAGGAAAAUAAAAGAUUUC	2977	GAAATCTTTTATTTTCCTTGCCTGC	3581
1301	UAAAAGAUUUCCAGUGACAGAAAAA	2978	TTTTTCTGTCACTGGAAATCTTTTA	3582
1302	AAAAGAUUUCCAGUGACAGAAAAAU	2979	ATTTTTCTGTCACTGGAAATCTTTT	3583
1393	UAUAUUUUGAAAUGAACUUGUUGGC	2980	GCCAACAAGTTCATTTCAAAATATA	3584
1394	AUAUUUUGAAAUGAACUUGUUGGCC	2981	GGCCAACAAGTTCATTTCAAAATAT	3585
1395	UAUUUUGAAAUGAACUUGUUGGCCC	2982	GGGCCAACAAGTTCATTTCAAAATA	3586
1396	AUUUUGAAAUGAACUUGUUGGCCCA	2983	TGGGCCAACAAGTTCATTTCAAAAT	3587
1397	UUUUGAAAUGAACUUGUUGGCCCAU	2984	ATGGGCCAACAAGTTCATTTCAAAA	3588
1398	UUUGAAAUGAACUUGUUGGCCCAUC	2985	GATGGGCCAACAAGTTCATTTCAAA	3589
1399	UUGAAAUGAACUUGUUGGCCCAUCU	2986	AGATGGGCCAACAAGTTCATTTCAA	3590
1400	UGAAAUGAACUUGUUGGCCCAUCUA	2987	TAGATGGGCCAACAAGTTCATTTCA	3591
1401	GAAAUGAACUUGUUGGCCCAUCUAU	2988	ATAGATGGGCCAACAAGTTCATTTC	3592
1402	AAAUGAACUUGUUGGCCCAUCUAUU	2989	AATAGATGGGCCAACAAGTTCATTT	3593
1403	AAUGAACUUGUUGGCCCAUCUAUUA	2990	TAATAGATGGGCCAACAAGTTCATT	3594
1404	AUGAACUUGUUGGCCCAUCUAUUAC	2991	GTAATAGATGGGCCAACAAGTTCAT	3595
1405	UGAACUUGUUGGCCCAUCUAUUACA	2992	TGTAATAGATGGGCCAACAAGTTCA	3596
1406	GAACUUGUUGGCCCAUCUAUUACAU	2993	ATGTAATAGATGGGCCAACAAGTTC	3597
1407	AACUUGUUGGCCCAUCUAUUACAUC	2994	GATGTAATAGATGGGCCAACAAGTT	3598
1408	ACUUGUUGGCCCAUCUAUUACAUCU	2995	AGATGTAATAGATGGGCCAACAAGT	3599
1409	CUUGUUGGCCCAUCUAUUACAUCUA	2996	TAGATGTAATAGATGGGCCAACAAG	3600
1410	UUGUUGGCCCAUCUAUUACAUCUAC	2997	GTAGATGTAATAGATGGGCCAACAA	3601
1411	UGUUGGCCCAUCUAUUACAUCUACA	2998	TGTAGATGTAATAGATGGGCCAACA	3602
1412	GUUGGCCCAUCUAUUACAUCUACAG	2999	CTGTAGATGTAATAGATGGGCCAAC	3603
1413	UUGGCCCAUCUAUUACAUCUACAGC	3000	GCTGTAGATGTAATAGATGGGCCAA	3604
1414	UGGCCCAUCUAUUACAUCUACAGCU	3001	AGCTGTAGATGTAATAGATGGGCCA	3605
1415	GGCCCAUCUAUUACAUCUACAGCUG	3002	CAGCTGTAGATGTAATAGATGGGCC	3606
1416	GCCCAUCUAUUACAUCUACAGCUGA	3003	TCAGCTGTAGATGTAATAGATGGGC	3607
1422	CUAUUACAUCUACAGCUGACCCUUG	3004	CAAGGGTCAGCTGTAGATGTAATAG	3608
1423	UAUUACAUCUACAGCUGACCCUUGA	3005	TCAAGGGTCAGCTGTAGATGTAATA	3609
1424	AUUACAUCUACAGCUGACCCUUGAA	3006	TTCAAGGGTCAGCTGTAGATGTAAT	3610
1425	UUACAUCUACAGCUGACCCUUGAAC	3007	GTTCAAGGGTCAGCTGTAGATGTAA	3611

Table 30

1426	UACAUCUACAGCUGACCCUUGAACA	3008	TGTTCAAGGGTCAGCTGTAGATGTA	3612
1427	ACAUCUACAGCUGACCCUUGAACAU	3009	ATGTTCAAGGGTCAGCTGTAGATGT	3613
1428	CAUCUACAGCUGACCCUUGAACAUG	3010	CATGTTCAAGGGTCAGCTGTAGATG	3614
1429	AUCUACAGCUGACCCUUGAACAUGG	3011	CCATGTTCAAGGGTCAGCTGTAGAT	3615
1442	CCUUGAACAUGGGGGUUAGGGGAGC	3012	GCTCCCCTAACCCCCATGTTCAAGG	3616
1443	CUUGAACAUGGGGGUUAGGGGAGCU	3013	AGCTCCCCTAACCCCCATGTTCAAG	3617
1444	UUGAACAUGGGGGUUAGGGGAGCUG	3014	CAGCTCCCCTAACCCCCATGTTCAA	3618
1445	UGAACAUGGGGGUUAGGGGAGCUGA	3015	TCAGCTCCCCTAACCCCCATGTTCA	3619
1446	GAACAUGGGGGUUAGGGGAGCUGAC	3016	GTCAGCTCCCCTAACCCCCATGTTC	3620
1447	AACAUGGGGGUUAGGGGAGCUGACA	3017	TGTCAGCTCCCCTAACCCCCATGTT	3621
1448	ACAUGGGGGUUAGGGGAGCUGACAA	3018	TTGTCAGCTCCCCTAACCCCCATGT	3622
1449	CAUGGGGGUUAGGGGAGCUGACAAU	3019	ATTGTCAGCTCCCCTAACCCCCATG	3623
1450	AUGGGGGUUAGGGGAGCUGACAAUU	3020	AATTGTCAGCTCCCCTAACCCCCAT	3624
1451	UGGGGGUUAGGGGAGCUGACAAUUC	3021	GAATTGTCAGCTCCCCTAACCCCCA	3625
1452	GGGGGUUAGGGGAGCUGACAAUUCG	3022	CGAATTGTCAGCTCCCCTAACCCCC	3626
1453	GGGGUUAGGGGAGCUGACAAUUCGU	3023	ACGAATTGTCAGCTCCCCTAACCCC	3627
1454	GGGUUAGGGGAGCUGACAAUUCGUG	3024	CACGAATTGTCAGCTCCCCTAACCC	3628
1455	GGUUAGGGGAGCUGACAAUUCGUGG	3025	CCACGAATTGTCAGCTCCCCTAACC	3629
1456	GUUAGGGGAGCUGACAAUUCGUGGG	3026	CCCACGAATTGTCAGCTCCCCTAAC	3630
1457	UUAGGGGAGCUGACAAUUCGUGGGU	3027	ACCCACGAATTGTCAGCTCCCCTAA	3631
1458	UAGGGGAGCUGACAAUUCGUGGGUC	3028	GACCCACGAATTGTCAGCTCCCCTA	3632
1459	AGGGGAGCUGACAAUUCGUGGGUCC	3029	GGACCCACGAATTGTCAGCTCCCCT	3633
1460	GGGGAGCUGACAAUUCGUGGGUCCG	3030	CGGACCCACGAATTGTCAGCTCCCC	3634
1462	GGAGCUGACAAUUCGUGGGUCCGCA	3031	TGCGGACCCACGAATTGTCAGCTCC	3635
1463	GAGCUGACAAUUCGUGGGUCCGCAA	3032	TTGCGGACCCACGAATTGTCAGCTC	3636
1464	AGCUGACAAUUCGUGGGUCCGCAAA	3033	TTTGCGGACCCACGAATTGTCAGCT	3637
1465	GCUGACAAUUCGUGGGUCCGCAAAA	3034	TTTTGCGGACCCACGAATTGTCAGC	3638
1466	CUGACAAUUCGUGGGUCCGCAAAAU	3035	ATTTTGCGGACCCACGAATTGTCAG	3639
1467	UGACAAUUCGUGGGUCCGCAAAAUC	3036	GATTTTGCGGACCCACGAATTGTCA	3640
1468	GACAAUUCGUGGGUCCGCAAAAUCU	3037	AGATTTTGCGGACCCACGAATTGTC	3641
1469	ACAAUUCGUGGGUCCGCAAAAUCUU	3038	AAGATTTTGCGGACCCACGAATTGT	3642
1470	CAAUUCGUGGGUCCGCAAAAUCUUA	3039	TAAGATTTTGCGGACCCACGAATTG	3643
1471	AAUUCGUGGGUCCGCAAAAUCUUAA	3040	TTAAGATTTTGCGGACCCACGAATT	3644
1472	AUUCGUGGGUCCGCAAAAUCUUAAC	3041	GTTAAGATTTTGCGGACCCACGAAT	3645
1473	UUCGUGGGUCCGCAAAAUCUUAACU	3042	AGTTAAGATTTTGCGGACCCACGAA	3646
1474	UCGUGGGUCCGCAAAAUCUUAACUA	3043	TAGTTAAGATTTTGCGGACCCACGA	3647
1475	CGUGGGUCCGCAAAAUCUUAACUAC	3044	GTAGTTAAGATTTTGCGGACCCACG	3648
1476	GUGGGUCCGCAAAAUCUUAACUACC	3045	GGTAGTTAAGATTTTGCGGACCCAC	3649
1477	UGGGUCCGCAAAAUCUUAACUACCU	3046	AGGTAGTTAAGATTTTGCGGACCCA	3650
1478	GGGUCCGCAAAAUCUUAACUACCUA	3047	TAGGTAGTTAAGATTTTGCGGACCC	3651
1479	GGUCCGCAAAAUCUUAACUACCUAA	3048	TTAGGTAGTTAAGATTTTGCGGACC	3652
1480	GUCCGCAAAAUCUUAACUACCUAAU	3049	ATTAGGTAGTTAAGATTTTGCGGAC	3653
1481	UCCGCAAAAUCUUAACUACCUAAUA	3050	TATTAGGTAGTTAAGATTTTGCGGA	3654

Input Sequence = PLN
Oligo Length = 25
PLN (Homo sapiens phospholamban (PLN) mRNA.; 1635 bp)

Table 31

Table 31: Anti-Her2 Ribozyme and Substrate Sequence

RPI Nos	nt. Position	NCH Ribozyme Sequence	Seq ID Nos	NCH Substrate Sequence	Seq ID Nos
17214	175	asgscsuscca cUGAuGaggccguuaggccGaa Igugcuc B		GAGCACC A UGGAGCU	
17215	212	gsasgsgsgcg cUGAuGaggccguuaggccGaa Igaggag B		CUCCUCC U CGCCCUC	
17216	261	uscsasusguc cUGAuGaggccguuaggccGaa Iugccgg B		CCGGCAC A GACAUGA	
17217	297	cscsasgsgug cUGAuGaggccguuaggccGaa Iucucgg B		CCGAGAC C CACCUGG	
17218	381	ascsasgsgcu cUGAuGaggccguuaggccGaa Icauugg B		CCAAUGC C AGCCUGU	
17219	619	cscsususuca cUGAuGaggccguuaggccGaa Iaucucu B		AGAGAUC U UGAAAGG	
17220	665	csgsusgsucc cUGAuGaggccguuaggccGaa Iguagca B		UGCUACC A GGACACG	
17221	943	ususgsasagu cUGAuGaggccguuaggccGaa Iaggcag B		CUGCCUC C ACUUCAA	
17222	944	gsususgsaag cUGAuGaggccguuaggccGaa Igaggca B		UGCCUCC A CUUCAAC	
17223	946	usgsgsusuga cUGAuGaggccguuaggccGaa Iuggagg B		CCUCCAC U UCAACCA	
17224	993	usgsususgua cUGAuGaggccguuaggccGaa Iugacca B		UGGUCAC C UACAACA	
17225	997	uscsusgsugu cUGAuGaggccguuaggccGaa Iuaggug B		CACCUAC A ACACAGA	
17226	1000	gsusgsuscug cUGAuGaggccguuaggccGaa Iuuguag B		CUACAAC A CAGACAC	
17227	1017	usgsgsgscau cUGAuGaggccguuaggccGaa Iacucaa B		UUGAGUC C AUGCCCA	
17228	1078	asgsgsusagu cUGAuGaggccguuaggccGaa Iuaggga B		UCCCUAC A ACUACCU	
17229	1201	asgsascscau cUGAuGaggccguuaggccGaa Icacacu B		AGUGUGC U AUGGUCU	
17230	1285	csuscscscaa cUGAuGaggccguuaggccGaa Iaucuuc B		GAAGAUC U UUGGGAG	
17231	1395	gsgsusasacc cUGAuGaggccguuaggccGaa Iugaucu B		AGAUCAC A GGUUACC	
17232	1413	gscscsasugc cUGAuGaggccguuaggccGaa Iagaugu B		ACAUCUC A GCAUGGC	
17233	1450	asgsgsusucu cUGAuGaggccguuaggccGaa Iaagacg B		CGUCUUC C AGAACCU	
17234	1624	asasgsasgcu cUGAuGaggccguuaggccGaa Iucccag B		CUGGGAC C AGCUCUU	
17235	1787	gscsascsucc cUGAuGaggccguuaggccGaa Igccccg B		CGGGGCC A GGAGUGC	
17236	2001	gscsasusgua cUGAuGaggccguuaggccGaa Iagaggu B		ACCUCUC C UACAUGC	
17237	2002	gsgscsasugu cUGAuGaggccguuaggccGaa Igagagg B		CCUCUCC U ACAUGCC	
17238	2055	asgsusugau cUGAuGaggccguuaggccGaa Iggcaag B		CUUGCCC C AUCAACU	

Table 31

17239	2056	csasgsusuga cUGAuGaggccguuaggccGaa Igggcaa B		UUGCCCC A UCAACUG	
17240	2068	csasgsgsagu cUGAuGaggccguuaggccGaa Igugcag B		CUGCACC C ACUCCUG	
17241	2069	ascsasgsgag cUGAuGaggccguuaggccGaa Iggugca B		UGCACCC A CUCCUGU	
17242	2295	cscsusgsguu cUGAuGaggccguuaggccGaa Igcaucg B		CGAUGCC C AACCAGG	
17243	2351	asgsasuscca cUGAuGaggccguuaggccGaa Icaccuu B		AAGGUGC U UGGAUCU	
17244	2373	usgsusasgac cUGAuGaggccguuaggccGaa Iugccaa B		UUGGCAC A GUCUACA	
17245	2570	csasusasagc cUGAuGaggccguuaggccGaa Iugucac B		GUGACAC A GCUUAUG	
17246	2665	asuscscsccu cUGAuGaggccguuaggccGaa Igcaauc B		GAUUGCC A AGGGGAU	
17247	2702	gsuscscscug cUGAuGaggccguuaggccGaa Iuacgag B		CUCGUAC A CAGGGAC	
17248	2771	cscsgsasgcc cUGAuGaggccguuaggccGaa Icccgaa B		UUCGGGC U GGCUCGG	
18261	2780	gsuscscsagc cUGAuGaggccguuaggccGaa Iccgagc B		GCUCGGC U GCUGGAC	
17249	2783	asasusgsucc cUGAuGaggccguuaggccGaa Icagccg B		CGGCUGC U GGACAUU	
18265	2783	asusgsuscc cUGAuGaggccguuaggccGaa Icagcc B		GGCUGC U GGACAU	
18267	2783	asasusgsucc cUGAuGaggcguuagccGaa Icagccg B		CGGCUGC U GGACAUU	
18269	2783	asusgsuscc cUGAuGaggcguuagccGaa Icagcc B		GGCUGC U GGACAU	
18271	2783	asasusgsucc cUGAUGaggccguuaggccGaa Icagccg B		CGGCUGC U GGACAUU	
18273	2783	asusgsuscc cUGAUGaggccguuaggccGaa Icagcc B		GGCUGC U GGACAU	
18275	2783	asasusgsucc cUGAUGaggcguuagccGaa Icagccg B		CGGCUGC U GGACAUU	
18277	2783	asusgsuscc cUGAUGaggcguuagccGaa Icagcc B		GGCUGC U GGACAU	
18262	2788	uscsgsuscaa cUGAuGaggccguuaggccGaa Iuccagc B		GCUGGAC A UUGACGA	
17250	2799	gsgsusascuc cUGAuGaggccguuaggccGaa Iucucgu B		ACGAGAC A GAGUACC	
18263	2935	usasasgsguu cUGAuGaggccguuaggccGaa Igcccca B		UGGGGCC A AACCUUA	
17251	2939	asuscsgsuaa cUGAuGaggccguuaggccGaa Iuuuggc B		GCCAAAC C UUACGAU	
18266	2939	uscsgsusaa cUGAuGaggccguuaggccGaa Iuuugg B		CCAAAC C UUACGA	
18268	2939	asuscsgsuaa cUGAuGaggcguuagccGaa Iuuuggc B		GCCAAAC C UUACGAU	
18270	2939	uscsgsusaa cUGAuGaggcguuagccGaa Iuuugg B		CCAAAC C UUACGA	
18272	2939	asuscsgsuaa cUGAUGaggccguuaggccGaa Iuuuggc B		GCCAAAC C UUACGAU	
18274	2939	uscsgsusaa cUGAUGaggccguuaggccGaa Iuuugg B		CCAAAC C UUACGA	
18276	2939	asuscsgsuaa cUGAUGaggcguuagccGaa Iuuuggc B		GCCAAAC C UUACGAU	
18278	2939	uscsgsusaa cUGAUGaggcguuagccGaa Iuuugg B		CCAAAC C UUACGA	
18264	2940	csasuscsgua cUGAuGaggccguuaggccGaa Iguuugg B		CCAAACC U UACGAUG	

Table 31

17252	3096	asgsasasuuc cUGAuGaggccguuaggccGaa Iacacca B		UGGUGUC U GAAUUCU	
17253	3423	asusascsauc cUGAuGaggccguuaggccGaa Iagccag B		CUGGCUC C GAUGUAU	
17254	3491	asgsgsgscug cUGAuGaggccguuaggccGaa Igucaug B		CAUGACC C CAGCCCU	
17255	3497	csusgsusaga cUGAuGaggccguuaggccGaa Igcuggg B		CCCAGCC C UCUACAG	
17256	3546	asgscscsauc cUGAuGaggccguuaggccGaa Iucucag B		CUGAGAC U GAUGGCU	
17257	3669	cscsasgsagu cUGAuGaggccguuaggccGaa Icaccag B		CUGGUGC C ACUCUGG	
17258	3690	gsgsgsasgag cUGAuGaggccguuaggccGaa Iucuugg B		CCAAGAC U CUCUCCC	
17259	3744	uscsuscscac cUGAuGaggccguuaggccGaa Icacccc B		GGGGUGC C GUGGAGA	
17260	3817	asasgsgscug cUGAuGaggccguuaggccGaa Icugaag B		CUUCAGC C CAGCCUU	
17261	3832	usasasusaga cUGAuGaggccguuaggccGaa Iuugucg B		CGACAAC C UCUAUUA	
17262	3998	gsasasgsuca cUGAuGaggccguuaggccGaa Iccuucc B		GGAAGGC C UGACUUC	
		Hammerhead Ribozyme Sequence		HH Substrate Sequence	
17180	191	gscsgsgscac cUGAuGaggccguuaggccGaa Aggccgc B		GCGGCCU U GUGCCGC	
17202	312	gsgsusgsgcg cUGAuGaggccguuaggccGaa Agcaugu B		ACAUGCU C CGCCACC	
17182	495	cscsuscsaaa cUGAuGaggccguuaggccGaa Agcuggg B		CCCAGCU C UUUGAGG	
17183	498	usgsuscscuc cUGAuGaggccguuaggccGaa Aagagcu B		AGCUCUU U GAGGACA	
17181	633	gsgsasuscaa cUGAuGaggccguuaggccGaa Accccuc B		GAGGGGU C UUGAUCC	
17276	831	gsgscsasca cUGAuGaguccgugaggacGaa Acagugc B		GCACUGUCUGUGCC	
17203	995	usgsusgsuug cUGAuGaggccguuaggccGaa Aggugac B		GUCACCU A CAACACA	
17184	1076	gsusasgsuug cUGAuGaggccguuaggccGaa Agggaca B		UGUCCCU A CAACUAC	
17185	1202	csasgsascca cUGAuGaggccguuaggccGaa Agcacac B		GUGUGCU A UGGUCUG	
17186	1286	gscsuscscca cUGAuGaggccguuaggccGaa Agaucuu B		AAGAUCU U UGGGAGC	
17187	1287	gsgscsusccc cUGAuGaggccguuaggccGaa Aagaucu B		AGAUCUU U GGGAGCC	
17188	1317	cscscscsauc cUGAuGaggccguuaggccGaa Aagcucu B		AGAGCUU U GAUGGGG	
17204	1412	cscsasusgcu cUGAuGaggccguuaggccGaa Agaugua B		UACAUCU C AGCAUGG	
17189	1448	gsususcsugg cUGAuGaggccguuaggccGaa Agacgcu B		AGCGUCU U CCAGAAC	
17190	1449	gsgsusuwcug cUGAuGaggccguuaggccGaa Aagacgc B		GCGUCUU C CAGAACC	
17191	1632	gsgsususccg cUGAuGaggccguuaggccGaa Aagagcu B		AGCUCUU U CGGAACC	
17192	1761	usgscsasguu cUGAuGaggccguuaggccGaa Acacacu B		AGUGUGU C AACUGCA	
17193	2000	csasusgsuag cUGAuGaggccguuaggccGaa Agagguc B		GACCUCU C CUACAUG	

Table 31

17194	2003	gsgsgscsaug cUGAuGaggccguuaggccGaa Aggagag B		CUCUCCU A CAUGCCC	
17205	2058	usgscsasguu cUGAuGaggccguuaggccGaa Auggggc B		GCCCCAU C AACUGCA	
17206	2072	csascsascag cUGAuGaggccguuaggccGaa Agugggu B		ACCCACU C CUGUGUG	
17195	2352	csasgsasucc cUGAuGaggccguuaggccGaa Agcaccu B		AGGUGCU U GGAUCUG	
17196	2575	usasgsgsgca cUGAuGaggccguuaggccGaa Aagcugu B		ACAGCUU A UGCCCUA	
17197	2697	usgsusgsuac cUGAuGaggccguuaggccGaa Agccgca B		UGCGGCU C GUACACA	
18257	2776	asgscsasgcc cUGAuGaggccguuaggccGaa Agccagc B		GCUGGCU C GGCUGCU	
18258	2790	uscsuscsguc cUGAuGaggccguuaggccGaa Augucca B		UGGACAU U GACGAGA	
17207	2926	gscscscscaa cUGAuGaggccguuaggccGaa Agucauc B		GAUGACU U UUGGGGC	
18259	2928	usgsgscsccc cUGAuGaggccguuaggccGaa Aaaguca B		UGACUUU U GGGGCCA	
18260	2942	cscscsasucg cUGAuGaggccguuaggccGaa Aagguuu B		AAACCUU A CGAUGGG	
17198	3089	asgsascsacc cUGAuGaggccguuaggccGaa Acucccg B		CGGGAGU U GGUGUCU	
17208	3155	usgsgsgsccc cUGAuGaggccguuaggccGaa Aguccuc B		GAGGACU U GGGCCCA	
17209	3499	csgscsusgua cUGAuGaggccguuaggccGaa Agggcug B		CAGCCCU C UACAGCG	
17210	3501	ascscsgscug cUGAuGaggccguuaggccGaa Agagggc B		GCCCUCU A CAGCGGU	
17211	3714	csusususgac cUGAuGaggccguuaggccGaa Accccau B		AUGGGGU C GUCAAAG	
17199	3802	gscsasgsgag cUGAuGaggccguuaggccGaa Agggugg B		CCACCCU C CUCCUGC	
17200	3825	gsgsususguc cUGAuGaggccguuaggccGaa Aaggcug B		CAGCCUU C GACAACC	
17201	3838	uscscscsagu cUGAuGaggccguuaggccGaa Auagagg B		CCUCUAU U ACUGGGA	

Lowercase = 2'-*O*-methyl Modifications
Uppercase: 1. Uppercase U under Ribozyme Sequence = 2'-*C*-Allyl U
2. All other Uppercases = Ribonucleotides
I = Inosine
B = 3'-3' Inverted abasic deoxyribose

Table 32

Table 32: RNA Cleavage by NCH-XYLO Ribozyme (Reaction: 50 mM TRIS-Cl pH 7.5, 10 mM Mg^{2+}, 37°C, 500 nM FINAL [Rz], Trace Substrate)

DATA SUMMARY

NCH-Xylo Ribozyme (RPI No.)	TARGET TRIPLET 5′-NCX-3′	k_{obs} (min.$^{-1}$) guua + A15.1 = xylo
14827	5′-GCA-3′	1.649
14828	5′-ACA-3′	0.293
14829	5′-UCA-3′	0.272
14830	5′-CCA-3′	0.214

Table 33

Table 33: Examples of NCH-Xylo Ribozyme and Substrate Sequences

RPI Nos.	Ribozyme Sequence	Seq. ID. Nos.	Substrate Sequence	Seq. ID. Nos.
14827	5'-ucu cca u cUGA uGa ggcc guua ggcc Gaa I cuc ccuB-3'		5'-AGGGA GCA AUGGAGA-3'	
14828	5'-ucu cca u cUGA uGa ggcc guua ggcc Gaa I uuc ccuB-3'		5'-AGGGA ACA AUGGAGA-3'	
14829	5'-ucu cca u cUGA uGa ggcc guua ggcc Gaa I auc ccuB-3'		5'-AGGGA UCA AUGGAGA-3'	
14830	5'-ucu cca u cUGA uGa ggcc guua ggcc Gaa I guc ccuB-3'		5'-AGGGA CCA AUGGAGA-3'	

Uppercase = Ribonucleotides
Lowercase = 2'-O-methyl nucleotides
I = Xylo -Inosine
B = 3'-3' inverted abasic
U = 2'-C-allyl-U

Table 34

Table 34: Anti-HER2 NCH Ribozyme and Target Sequences

nt. Position	NCH Substrate Sequence	Seq. ID Nos.	NCH Ribozyme Sequence	Seq. ID Nos.
14	AGGUAAC C CUGGCCC		GGGCCAG CUGAUGAG X CGAA IUUACCU	
15	GGUAACC C UGGCCCC		GGGGCCA CUGAUGAG X CGAA IGUUACC	
16	GUAACCC U GGCCCCU		AGGGGCC CUGAUGAG X CGAA IGGUUAC	
20	CCCUGGC C CCUUUGG		CCAAAGG CUGAUGAG X CGAA ICCAGGG	
21	CCUGGCC C CUUUGGU		ACCAAAG CUGAUGAG X CGAA IGCCAGG	
22	CUGGCCC C UUUGGUC		GACCAAA CUGAUGAG X CGAA IGGCCAG	
23	UGGCCCC U UUGGUCG		CGACCAA CUGAUGAG X CGAA IGGGCCA	
35	UCGGGGC C CCGGGCA		UGCCCGG CUGAUGAG X CGAA ICCCCGA	
36	CGGGGCC C CGGGCAG		CUGCCCG CUGAUGAG X CGAA IGCCCCG	
37	GGGGCCC C GGGCAGC		GCUGCCC CUGAUGAG X CGAA IGGCCCC	
42	CCCGGGC A GCCGCGC		GCGCGGC CUGAUGAG X CGAA ICCCGGG	
45	GGGCAGC C GCGCGCC		GGCGCGC CUGAUGAG X CGAA ICUGCCC	
52	CGCGCGC C CCUUCCC		GGGAAGG CUGAUGAG X CGAA ICGCGCG	
53	GCGCGCC C CUUCCCA		UGGGAAG CUGAUGAG X CGAA IGCGCGC	
54	CGCGCCC C UUCCCAC		GUGGGAA CUGAUGAG X CGAA IGGCGCG	
55	GCGCCCC U UCCCACG		CGUGGGA CUGAUGAG X CGAA IGGGCGC	
58	CCCCUUC C CACGGGG		CCCCGUG CUGAUGAG X CGAA IAAGGGG	
59	CCCUUCC C ACGGGGC		GCCCCGU CUGAUGAG X CGAA IGAAGGG	
60	CCUUCCC A CGGGGCC		GGCCCCG CUGAUGAG X CGAA IGGAAGG	
67	ACGGGGC C CUUUACU		AGUAAAG CUGAUGAG X CGAA ICCCCGU	
68	CGGGGCC C UUUACUG		CAGUAAA CUGAUGAG X CGAA IGCCCCG	
69	GGGGCCC U UUACUGC		GCAGUAA CUGAUGAG X CGAA IGGCCCC	
74	CCUUUAC U GCGCCGC		GCGGCGC CUGAUGAG X CGAA IUAAAGG	
79	ACUGCGC C GCGCGCC		GGCGCGC CUGAUGAG X CGAA ICGCAGU	
86	CGCGCGC C CGGCCCC		GGGGCCG CUGAUGAG X CGAA ICGCGCG	
87	GCGCGCC C GGCCCCC		GGGGGCC CUGAUGAG X CGAA IGCGCGC	
91	GCCCGGC C CCCACCC		GGGUGGG CUGAUGAG X CGAA ICCGGGC	
92	CCCGGCC C CCACCCC		GGGGUGG CUGAUGAG X CGAA IGCCGGG	
93	CCGGCCC C CACCCCU		AGGGGUG CUGAUGAG X CGAA IGGCCGG	
94	CGGCCCC C ACCCCUC		GAGGGGU CUGAUGAG X CGAA IGGGCCG	
95	GGCCCCC A CCCCUCG		CGAGGGG CUGAUGAG X CGAA IGGGGCC	
97	CCCCCAC C CCUCGCA		UGCGAGG CUGAUGAG X CGAA IUGGGGG	
98	CCCCACC C CUCGCAG		CUGCGAG CUGAUGAG X CGAA IGUGGGG	
99	CCCACCC C UCGCAGC		GCUGCGA CUGAUGAG X CGAA IGGUGGG	
100	CCACCCC U CGCAGCA		UGCUGCG CUGAUGAG X CGAA IGGGUGG	
104	CCCUCGC A GCACCCC		GGGGUGC CUGAUGAG X CGAA ICGAGGG	
107	UCGCAGC A CCCCGCG		CGCGGGG CUGAUGAG X CGAA ICUGCGA	
109	GCAGCAC C CCGCGCC		GGCGCGG CUGAUGAG X CGAA IUGCUGC	
110	CAGCACC C CGCGCCC		GGGCGCG CUGAUGAG X CGAA IGUGCUG	
111	AGCACCC C GCGCCCC		GGGGCGC CUGAUGAG X CGAA IGGUGCU	
116	CCCGCGC C CCGCGCC		GGCGCGG CUGAUGAG X CGAA ICGCGGG	
117	CCGCGCC C CGCGCCC		GGGCGCG CUGAUGAG X CGAA IGCGCGG	

Table 34

118	CGCGCCC C GCGCCCU		AGGGCGC CUGAUGAG X CGAA IGGCGCG	
123	CCCGCGC C CUCCCAG		CUGGGAG CUGAUGAG X CGAA ICGCGGG	
124	CCGCGCC C UCCCAGC		GCUGGGA CUGAUGAG X CGAA IGCGCGG	
125	CGCGCCC U CCCAGCC		GGCUGGG CUGAUGAG X CGAA IGGCGCG	
127	CGCCCUC C CAGCCGG		CCGGCUG CUGAUGAG X CGAA IAGGGCG	
128	GCCCUCC C AGCCGGG		CCCGGCU CUGAUGAG X CGAA IGAGGGC	
129	CCCUCCC A GCCGGGU		ACCCGGC CUGAUGAG X CGAA IGGAGGG	
132	UCCCAGC C GGGUCCA		UGGACCC CUGAUGAG X CGAA ICUGGGA	
138	CCGGGUC C AGCCGGA		UCCGGCU CUGAUGAG X CGAA IACCCGG	
139	CGGGUCC A GCCGGAG		CUCCGGC CUGAUGAG X CGAA IGACCCG	
142	GUCCAGC C GGAGCCA		UGGCUCC CUGAUGAG X CGAA ICUGGAC	
148	CCGGAGC C AUGGGGC		GCCCCAU CUGAUGAG X CGAA ICUCCGG	
149	CGGAGCC A UGGGGCC		GGCCCCA CUGAUGAG X CGAA IGCUCCG	
156	AUGGGGC C GGAGCCG		CGGCUCC CUGAUGAG X CGAA ICCCCAU	
162	CCGGAGC C GCAGUGA		UCACUGC CUGAUGAG X CGAA ICUCCGG	
165	GAGCCGC A GUGAGCA		UGCUCAC CUGAUGAG X CGAA ICGGCUC	
172	AGUGAGC A CCAUGGA		UCCAUGG CUGAUGAG X CGAA ICUCACU	
174	UGAGCAC C AUGGAGC		GCUCCAU CUGAUGAG X CGAA IUGCUCA	
175	GAGCACC A UGGAGCU		AGCUCCA CUGAUGAG X CGAA IGUGCUC	
182	AUGGAGC U GGCGGCC		GGCCGCC CUGAUGAG X CGAA ICUCCAU	
189	UGGCGGC C UUGUGCC		GGCACAA CUGAUGAG X CGAA ICCGCCA	
190	GGCGGCC U UGUGCCG		CGGCACA CUGAUGAG X CGAA IGCCGCC	
196	CUUGUGC C GCUGGGG		CCCCAGC CUGAUGAG X CGAA ICACAAG	
199	GUGCCGC U GGGGGCU		AGCCCCC CUGAUGAG X CGAA ICGGCAC	
206	UGGGGGC U CCUCCUC		GAGGAGG CUGAUGAG X CGAA ICCCCCA	
208	GGGGCUC C UCCUCGC		GCGAGGA CUGAUGAG X CGAA IAGCCCC	
209	GGGCUCC U CCUCGCC		GGCGAGG CUGAUGAG X CGAA IGAGCCC	
211	GCUCCUC C UCGCCCU		AGGGCGA CUGAUGAG X CGAA IAGGAGC	
212	CUCCUCC U CGCCCUC		GAGGGCG CUGAUGAG X CGAA IGAGGAG	
216	UCCUCGC C CUCUUGC		GCAAGAG CUGAUGAG X CGAA ICGAGGA	
217	CCUCGCC C UCUUGCC		GGCAAGA CUGAUGAG X CGAA IGCGAGG	
218	CUCGCCC U CUUGCCC		GGGCAAG CUGAUGAG X CGAA IGGCGAG	
220	CGCCCUC U UGCCCCC		GGGGGCA CUGAUGAG X CGAA IAGGGCG	
224	CUCUUGC C CCCCGGA		UCCGGGG CUGAUGAG X CGAA ICAAGAG	
225	UCUUGCC C CCCGGAG		CUCCGGG CUGAUGAG X CGAA IGCAAGA	
226	CUUGCCC C CCGGAGC		GCUCCGG CUGAUGAG X CGAA IGGCAAG	
227	UUGCCCC C CGGAGCC		GGCUCCG CUGAUGAG X CGAA IGGGCAA	
228	UGCCCCC C GGAGCCG		CGGCUCC CUGAUGAG X CGAA IGGGGCA	
234	CCGGAGC C GCGAGCA		UGCUCGC CUGAUGAG X CGAA ICUCCGG	
241	CGCGAGC A CCCAAGU		ACUUGGG CUGAUGAG X CGAA ICUCGCG	
243	CGAGCAC C CAAGUGU		ACACUUG CUGAUGAG X CGAA IUGCUCG	
244	GAGCACC C AAGUGUG		CACACUU CUGAUGAG X CGAA IGUGCUC	
245	AGCACCC A AGUGUGC		GCACACU CUGAUGAG X CGAA IGGUGCU	
253	AGUGUGC A CCGGCAC		GUGCCGG CUGAUGAG X CGAA ICACACU	
255	UGUGCAC C GGCACAG		CUGUGCC CUGAUGAG X CGAA IUGCACA	
259	CACCGGC A CAGACAU		AUGUCUG CUGAUGAG X CGAA ICCGGUG	
261	CCGGCAC A GACAUGA		UCAUGUC CUGAUGAG X CGAA IUGCCGG	

Table 34

265	CACAGAC A UGAAGCU		AGCUUCA CUGAUGAG X CGAA IUCUGUG	
272	AUGAAGC U GCGGCUC		GAGCCGC CUGAUGAG X CGAA ICUUCAU	
278	CUGCGGC U CCCUGCC		GGCAGGG CUGAUGAG X CGAA ICCGCAG	
280	GCGGCUC C CUGCCAG		CUGGCAG CUGAUGAG X CGAA IAGCCGC	
281	CGGCUCC C UGCCAGU		ACUGGCA CUGAUGAG X CGAA IGAGCCG	
282	GGCUCCC U GCCAGUC		GACUGGC CUGAUGAG X CGAA IGGAGCC	
285	UCCCUGC C AGUCCCG		CGGGACU CUGAUGAG X CGAA ICAGGGA	
286	CCCUGCC A GUCCCGA		UCGGGAC CUGAUGAG X CGAA IGCAGGG	
290	GCCAGUC C CGAGACC		GGUCUCG CUGAUGAG X CGAA IACUGGC	
291	CCAGUCC C GAGACCC		GGGUCUC CUGAUGAG X CGAA IGACUGG	
297	CCGAGAC C CACCUGG		CCAGGUG CUGAUGAG X CGAA IUCUCGG	
298	CGAGACC C ACCUGGA		UCCAGGU CUGAUGAG X CGAA IGUCUCG	
299	GAGACCC A CCUGGAC		GUCCAGG CUGAUGAG X CGAA IGGUCUC	
301	GACCCAC C UGGACAU		AUGUCCA CUGAUGAG X CGAA IUGGGUC	
302	ACCCACC U GGACAUG		CAUGUCC CUGAUGAG X CGAA IGUGGGU	
307	CCUGGAC A UGCUCCG		CGGAGCA CUGAUGAG X CGAA IUCCAGG	
311	GACAUGC U CCGCCAC		GUGGCGG CUGAUGAG X CGAA ICAUGUC	
313	CAUGCUC C GCCACCU		AGGUGGC CUGAUGAG X CGAA IAGCAUG	
316	GCUCCGC C ACCUCUA		UAGAGGU CUGAUGAG X CGAA ICGGAGC	
317	CUCCGCC A CCUCUAC		GUAGAGG CUGAUGAG X CGAA IGCGGAG	
319	CCGCCAC C UCUACCA		UGGUAGA CUGAUGAG X CGAA IUGGCGG	
320	CGCCACC U CUACCAG		CUGGUAG CUGAUGAG X CGAA IGUGGCG	
322	CCACCUC U ACCAGGG		CCCUGGU CUGAUGAG X CGAA IAGGUGG	
325	CCUCUAC C AGGGCUG		CAGCCCU CUGAUGAG X CGAA IUAGAGG	
326	CUCUACC A GGGCUGC		GCAGCCC CUGAUGAG X CGAA IGUAGAG	
331	CCAGGGC U GCCAGGU		ACCUGGC CUGAUGAG X CGAA ICCCUGG	
334	GGGCUGC C AGGUGGU		ACCACCU CUGAUGAG X CGAA ICAGCCC	
335	GGCUGCC A GGUGGUG		CACCACC CUGAUGAG X CGAA IGCAGCC	
344	GUGGUGC A GGGAAAC		GUUUCCC CUGAUGAG X CGAA ICACCAC	
352	GGGAAAC C UGGAACU		AGUUCCA CUGAUGAG X CGAA IUUUCCC	
353	GGAAACC U GGAACUC		GAGUUCC CUGAUGAG X CGAA IGUUUCC	
359	CUGGAAC U CACCUAC		GUAGGUG CUGAUGAG X CGAA IUUCCAG	
361	GGAACUC A CCUACCU		AGGUAGG CUGAUGAG X CGAA IAGUUCC	
363	AACUCAC C UACCUGC		GCAGGUA CUGAUGAG X CGAA IUGAGUU	
364	ACUCACC U ACCUGCC		GGCAGGU CUGAUGAG X CGAA IGUGAGU	
367	CACCUAC C UGCCCAC		GUGGGCA CUGAUGAG X CGAA IUAGGUG	
368	ACCUACC U GCCCACC		GGUGGGC CUGAUGAG X CGAA IGUAGGU	
371	UACCUGC C CACCAAU		AUUGGUG CUGAUGAG X CGAA ICAGGUA	
372	ACCUGCC C ACCAAUG		CAUUGGU CUGAUGAG X CGAA IGCAGGU	
373	CCUGCCC A CCAAUGC		GCAUUGG CUGAUGAG X CGAA IGGCAGG	
375	UGCCCAC C AAUGCCA		UGGCAUU CUGAUGAG X CGAA IUGGGCA	
376	GCCCACC A AUGCCAG		CUGGCAU CUGAUGAG X CGAA IGUGGGC	
381	CCAAUGC C AGCCUGU		ACAGGCU CUGAUGAG X CGAA ICAUUGG	
382	CAAUGCC A GCCUGUC		GACAGGC CUGAUGAG X CGAA IGCAUUG	
385	UGCCAGC C UGUCCUU		AAGGACA CUGAUGAG X CGAA ICUGGCA	
386	GCCAGCC U GUCCUUC		GAAGGAC CUGAUGAG X CGAA IGCUGGC	
390	GCCUGUC C UUCCUGC		GCAGGAA CUGAUGAG X CGAA IACAGGC	

Table 54

391	CCUGUCC U UCCUGCA		UGCAGGA CUGAUGAG X CGAA IGACAGG	
394	GUCCUUC C UGCAGGA		UCCUGCA CUGAUGAG X CGAA IAAGGAC	
395	UCCUUCC U GCAGGAU		AUCCUGC CUGAUGAG X CGAA IGAAGGA	
398	UUCCUGC A GGAUAUC		GAUAUCC CUGAUGAG X CGAA ICAGGAA	
406	GGAUAUC C AGGAGGU		ACCUCCU CUGAUGAG X CGAA IAUAUCC	
407	GAUAUCC A GGAGGUG		CACCUCC CUGAUGAG X CGAA IGAUAUC	
416	GAGGUGC A GGGCUAC		GUAGCCC CUGAUGAG X CGAA ICACCUC	
421	GCAGGGC U ACGUGCU		AGCACGU CUGAUGAG X CGAA ICCCUGC	
428	UACGUGC U CAUCGCU		AGCGAUG CUGAUGAG X CGAA ICACGUA	
430	CGUGCUC A UCGCUCA		UGAGCGA CUGAUGAG X CGAA IAGCACG	
435	UCAUCGC U CACAACC		GGUUGUG CUGAUGAG X CGAA ICGAUGA	
437	AUCGCUC A CAACCAA		UUGGUUG CUGAUGAG X CGAA IAGCGAU	
439	CGCUCAC A ACCAAGU		ACUUGGU CUGAUGAG X CGAA IUGAGCG	
442	UCACAAC C AAGUGAG		CUCACUU CUGAUGAG X CGAA IUUGUGA	
443	CACAACC A AGUGAGG		CCUCACU CUGAUGAG X CGAA IGUUGUG	
452	GUGAGGC A GGUCCCA		UGGGACC CUGAUGAG X CGAA ICCUCAC	
457	GCAGGUC C CACUGCA		UGCAGUG CUGAUGAG X CGAA IACCUGC	
458	CAGGUCC C ACUGCAG		CUGCAGU CUGAUGAG X CGAA IGACCUG	
459	AGGUCCC A CUGCAGA		UCUGCAG CUGAUGAG X CGAA IGGACCU	
461	GUCCCAC U GCAGAGG		CCUCUGC CUGAUGAG X CGAA IUGGGAC	
464	CCACUGC A GAGGCUG		CAGCCUC CUGAUGAG X CGAA ICAGUGG	
470	CAGAGGC U GCGGAUU		AAUCCGC CUGAUGAG X CGAA ICCUCUG	
487	GCGAGGC A CCCAGCU		AGCUGGG CUGAUGAG X CGAA ICCUCGC	
489	GAGGCAC C CAGCUCU		AGAGCUG CUGAUGAG X CGAA IUGCCUC	
490	AGGCACC C AGCUCUU		AAGAGCU CUGAUGAG X CGAA IGUGCCU	
491	GGCACCC A GCUCUUU		AAAGAGC CUGAUGAG X CGAA IGGUGCC	
494	ACCCAGC U CUUUGAG		CUCAAAG CUGAUGAG X CGAA ICUGGGU	
496	CCAGCUC U UUGAGGA		UCCUCAA CUGAUGAG X CGAA IAGCUGG	
505	UGAGGAC A ACUAUGC		GCAUAGU CUGAUGAG X CGAA IUCCUCA	
508	GGACAAC U AUGCCCU		AGGGCAU CUGAUGAG X CGAA IUUGUCC	
513	ACUAUGC C CUGGCCG		CGGCCAG CUGAUGAG X CGAA ICAUAGU	
514	CUAUGCC C UGGCCGU		ACGGCCA CUGAUGAG X CGAA IGCAUAG	
515	UAUGCCC U GGCCGUG		CACGGCC CUGAUGAG X CGAA IGGCAUA	
519	CCCUGGC C GUGCUAG		CUAGCAC CUGAUGAG X CGAA ICCAGGG	
524	GCCGUGC U AGACAAU		AUUGUCU CUGAUGAG X CGAA ICACGGC	
529	GCUAGAC A AUGGAGA		UCUCCAU CUGAUGAG X CGAA IUCUAGC	
538	UGGAGAC C CGCUGAA		UUCAGCG CUGAUGAG X CGAA IUCUCCA	
539	GGAGACC C GCUGAAC		GUUCAGC CUGAUGAG X CGAA IGUCUCC	
542	GACCCGC U GAACAAU		AUUGUUC CUGAUGAG X CGAA ICGGGUC	
547	GCUGAAC A AUACCAC		GUGGUAU CUGAUGAG X CGAA IUUCAGC	
552	ACAAUAC C ACCCCUG		CAGGGGU CUGAUGAG X CGAA IUAUUGU	
553	CAAUACC A CCCCUGU		ACAGGGG CUGAUGAG X CGAA IGUAUUG	
555	AUACCAC C CCUGUCA		UGACAGG CUGAUGAG X CGAA IUGGUAU	
556	UACCACC C CUGUCAC		GUGACAG CUGAUGAG X CGAA IGUGGUA	
557	ACCACCC C UGUCACA		UGUGACA CUGAUGAG X CGAA IGGUGGU	
558	CCACCCC U GUCACAG		CUGUGAC CUGAUGAG X CGAA IGGGUGG	
562	CCCUGUC A CAGGGGC		GCCCCUG CUGAUGAG X CGAA IACAGGG	

Table 34

564	CUGUCAC A GGGGCCU		AGGCCCC CUGAUGAG X CGAA IUGACAG	
570	CAGGGGC C UCCCCAG		CUGGGGA CUGAUGAG X CGAA ICCCCUG	
571	AGGGGCC U CCCCAGG		CCUGGGG CUGAUGAG X CGAA IGCCCCU	
573	GGGCCUC C CCAGGAG		CUCCUGG CUGAUGAG X CGAA IAGGCCC	
574	GGCCUCC C CAGGAGG		CCUCCUG CUGAUGAG X CGAA IGAGGCC	
575	GCCUCCC C AGGAGGC		GCCUCCU CUGAUGAG X CGAA IGGAGGC	
576	CCUCCCC A GGAGGCC		GGCCUCC CUGAUGAG X CGAA IGGGAGG	
583	AGGAGGC C UGCGGGA		UCCCGCA CUGAUGAG X CGAA ICCUCCU	
584	GGAGGCC U GCGGGAG		CUCCCGC CUGAUGAG X CGAA IGCCUCC	
593	CGGGAGC U GCAGCUU		AAGCUGC CUGAUGAG X CGAA ICUCCCG	
596	GAGCUGC A GCUUCGA		UCGAAGC CUGAUGAG X CGAA ICAGCUC	
599	CUGCAGC U UCGAAGC		GCUUCGA CUGAUGAG X CGAA ICUGCAG	
607	UCGAAGC C UCACAGA		UCUGUGA CUGAUGAG X CGAA ICUUCGA	
608	CGAAGCC U CACAGAG		CUCUGUG CUGAUGAG X CGAA IGCUUCG	
610	AAGCCUC A CAGAGAU		AUCUCUG CUGAUGAG X CGAA IAGGCUU	
612	GCCUCAC A GAGAUCU		AGAUCUC CUGAUGAG X CGAA IUGAGGC	
619	AGAGAUC U UGAAAGG		CCUUUCA CUGAUGAG X CGAA IAUCUCU	
634	AGGGGUC U UGAUCCA		UGGAUCA CUGAUGAG X CGAA IACCCCU	
640	CUUGAUC C AGCGGAA		UUCCGCU CUGAUGAG X CGAA IAUCAAG	
641	UUGAUCC A GCGGAAC		GUUCCGC CUGAUGAG X CGAA IGAUCAA	
649	GCGGAAC C CCCAGCU		AGCUGGG CUGAUGAG X CGAA IUUCCGC	
650	CGGAACC C CCAGCUC		GAGCUGG CUGAUGAG X CGAA IGUUCCG	
651	GGAACCC C CAGCUCU		AGAGCUG CUGAUGAG X CGAA IGGUUCC	
652	GAACCCC C AGCUCUG		CAGAGCU CUGAUGAG X CGAA IGGGUUC	
653	AACCCCC A GCUCUGC		GCAGAGC CUGAUGAG X CGAA IGGGGUU	
656	CCCCAGC U CUGCUAC		GUAGCAG CUGAUGAG X CGAA ICUGGGG	
658	CCAGCUC U GCUACCA		UGGUAGC CUGAUGAG X CGAA IAGCUGG	
661	GCUCUGC U ACCAGGA		UCCUGGU CUGAUGAG X CGAA ICAGAGC	
664	CUGCUAC C AGGACAC		GUGUCCU CUGAUGAG X CGAA IUAGCAG	
665	UGCUACC A GGACACG		CGUGUCC CUGAUGAG X CGAA IGUAGCA	
670	CCAGGAC A CGAUUUU		AAAAUCG CUGAUGAG X CGAA IUCCUGG	
688	GAAGGAC A UCUUCCA		UGGAAGA CUGAUGAG X CGAA IUCCUUC	
691	GGACAUC U UCCACAA		UUGUGGA CUGAUGAG X CGAA IAUGUCC	
694	CAUCUUC C ACAAGAA		UUCUUGU CUGAUGAG X CGAA IAAGAUG	
695	AUCUUCC A CAAGAAC		GUUCUUG CUGAUGAG X CGAA IGAAGAU	
697	CUUCCAC A AGAACAA		UUGUUCU CUGAUGAG X CGAA IUGGAAG	
703	CAAGAAC A ACCAGCU		AGCUGGU CUGAUGAG X CGAA IUUCUUG	
706	GAACAAC C AGCUGGC		GCCAGCU CUGAUGAG X CGAA IUUGUUC	
707	AACAACC A GCUGGCU		AGCCAGC CUGAUGAG X CGAA IGUUGUU	
710	AACCAGC U GGCUCUC		GAGAGCC CUGAUGAG X CGAA ICUGGUU	
714	AGCUGGC U CUCACAC		GUGUGAG CUGAUGAG X CGAA ICCAGCU	
716	CUGGCUC U CACACUG		CAGUGUG CUGAUGAG X CGAA IAGCCAG	
718	GGCUCUC A CACUGAU		AUCAGUG CUGAUGAG X CGAA IAGAGCC	
720	CUCUCAC A CUGAUAG		CUAUCAG CUGAUGAG X CGAA IUGAGAG	
722	CUCACAC U GAUAGAC		GUCUAUC CUGAUGAG X CGAA IUGUGAG	
730	GAUAGAC A CCAACCG		CGGUUGG CUGAUGAG X CGAA IUCUAUC	
732	UAGACAC C AACCGCU		AGCGGUU CUGAUGAG X CGAA IUGUCUA	

Table 34

733	AGACACC A ACCGCUC		GAGCGGU CUGAUGAG X CGAA IGUGUCU	
736	CACCAAC C GCUCUCG		CGAGAGC CUGAUGAG X CGAA IUUGGUG	
739	CAACCGC U CUCGGGC		GCCCGAG CUGAUGAG X CGAA ICGGUUG	
741	ACCGCUC U CGGGCCU		AGGCCCG CUGAUGAG X CGAA IAGCGGU	
747	CUCGGGC C UGCCACC		GGUGGCA CUGAUGAG X CGAA ICCCGAG	
748	UCGGGCC U GCCACCC		GGGUGGC CUGAUGAG X CGAA IGCCCGA	
751	GGCCUGC C ACCCCUG		CAGGGGU CUGAUGAG X CGAA ICAGGCC	
752	GCCUGCC A CCCCUGU		ACAGGGG CUGAUGAG X CGAA IGCAGGC	
754	CUGCCAC C CCUGUUC		GAACAGG CUGAUGAG X CGAA IUGGCAG	
755	UGCCACC C CUGUUCU		AGAACAG CUGAUGAG X CGAA IGUGGCA	
756	GCCACCC C UGUUCUC		GAGAACA CUGAUGAG X CGAA IGGUGGC	
757	CCACCCC U GUUCUCC		GGAGAAC CUGAUGAG X CGAA IGGGUGG	
762	CCUGUUC U CCGAUGU		ACAUCGG CUGAUGAG X CGAA IAACAGG	
764	UGUUCUC C GAUGUGU		ACACAUC CUGAUGAG X CGAA IAGAACA	
778	UAAGGGC U CCCGCUG		CAGCGGG CUGAUGAG X CGAA ICCCUUA	
780	AGGGCUC C CGCUGCU		AGCAGCG CUGAUGAG X CGAA IAGCCCU	
781	GGGCUCC C GCUGCUG		CAGCAGC CUGAUGAG X CGAA IGAGCCC	
784	CUCCCGC U GCUGGGG		CCCCAGC CUGAUGAG X CGAA ICGGGAG	
787	CCGCUGC U GGGGAGA		UCUCCCC CUGAUGAG X CGAA ICAGCGG	
801	AGAGUUC U GAGGAUU		AAUCCUC CUGAUGAG X CGAA IAACUCU	
812	GAUUGUC A GAGCCUG		CAGGCUC CUGAUGAG X CGAA IACAAUC	
817	UCAGAGC C UGACGCG		CGCGUCA CUGAUGAG X CGAA ICUCUGA	
818	CAGAGCC U GACGCGC		GCGCGUC CUGAUGAG X CGAA IGCUCUG	
826	GACGCGC A CUGUCUG		CAGACAG CUGAUGAG X CGAA ICGCGUC	
828	CGCGCAC U GUCUGUG		CACAGAC CUGAUGAG X CGAA IUGCGCG	
832	CACUGUC U GUGCCGG		CCGGCAC CUGAUGAG X CGAA IACAGUG	
837	UCUGUGC C GGUGGCU		AGCCACC CUGAUGAG X CGAA ICACAGA	
844	CGGUGGC U GUGCCCG		CGGGCAC CUGAUGAG X CGAA ICCACCG	
849	GCUGUGC C CGCUGCA		UGCAGCG CUGAUGAG X CGAA ICACAGC	
850	CUGUGCC C GCUGCAA		UUGCAGC CUGAUGAG X CGAA IGCACAG	
853	UGCCCGC U GCAAGGG		CCCUUGC CUGAUGAG X CGAA ICGGGCA	
856	CCGCUGC A AGGGGCC		GGCCCCU CUGAUGAG X CGAA ICAGCGG	
863	AAGGGGC C ACUGCCC		GGGCAGU CUGAUGAG X CGAA ICCCCUU	
864	AGGGGCC A CUGCCCA		UGGGCAG CUGAUGAG X CGAA IGCCCCU	
866	GGGCCAC U GCCCACU		AGUGGGC CUGAUGAG X CGAA IUGGCCC	
869	CCACUGC C CACUGAC		GUCAGUG CUGAUGAG X CGAA ICAGUGG	
870	CACUGCC C ACUGACU		AGUCAGU CUGAUGAG X CGAA IGCAGUG	
871	ACUGCCC A CUGACUG		CAGUCAG CUGAUGAG X CGAA IGGCAGU	
873	UGCCCAC U GACUGCU		AGCAGUC CUGAUGAG X CGAA IUGGGCA	
877	CACUGAC U GCUGCCA		UGGCAGC CUGAUGAG X CGAA IUCAGUG	
880	UGACUGC U GCCAUGA		UCAUGGC CUGAUGAG X CGAA ICAGUCA	
883	CUGCUGC C AUGAGCA		UGCUCAU CUGAUGAG X CGAA ICAGCAG	
884	UGCUGCC A UGAGCAG		CUGCUCA CUGAUGAG X CGAA IGCAGCA	
890	CAUGAGC A GUGUGCU		AGCACAC CUGAUGAG X CGAA ICUCAUG	
897	AGUGUGC U GCCGGCU		AGCCGGC CUGAUGAG X CGAA ICACACU	
900	GUGCUGC C GGCUGCA		UGCAGCC CUGAUGAG X CGAA ICAGCAC	
904	UGCCGGC U GCACGGG		CCCGUGC CUGAUGAG X CGAA ICCGGCA	

Table 34

907	CGGCUGC A CGGGCCC		GGGCCCG CUGAUGAG X CGAA ICAGCCG	
913	CACGGGC C CCAAGCA		UGCUUGG CUGAUGAG X CGAA ICCCGUG	
914	ACGGGCC C CAAGCAC		GUGCUUG CUGAUGAG X CGAA IGCCCGU	
915	CGGGCCC C AAGCACU		AGUGCUU CUGAUGAG X CGAA IGGCCCG	
916	GGGCCCC A AGCACUC		GAGUGCU CUGAUGAG X CGAA IGGGCCC	
920	CCCAAGC A CUCUGAC		GUCAGAG CUGAUGAG X CGAA ICUUGGG	
922	CAAGCAC U CUGACUG		CAGUCAG CUGAUGAG X CGAA IUGCUUG	
924	AGCACUC U GACUGCC		GGCAGUC CUGAUGAG X CGAA IAGUGCU	
928	CUCUGAC U GCCUGGC		GCCAGGC CUGAUGAG X CGAA IUCAGAG	
931	UGACUGC C UGGCCUG		CAGGCCA CUGAUGAG X CGAA ICAGUCA	
932	GACUGCC U GGCCUGC		GCAGGCC CUGAUGAG X CGAA IGCAGUC	
936	GCCUGGC C UGCCUCC		GGAGGCA CUGAUGAG X CGAA ICCAGGC	
937	CCUGGCC U GCCUCCA		UGGAGGC CUGAUGAG X CGAA IGCCAGG	
940	GGCCUGC C UCCACUU		AAGUGGA CUGAUGAG X CGAA ICAGGCC	
941	GCCUGCC U CCACUUC		GAAGUGG CUGAUGAG X CGAA IGCAGGC	
943	CUGCCUC C ACUUCAA		UUGAAGU CUGAUGAG X CGAA IAGGCAG	
944	UGCCUCC A CUUCAAC		GUUGAAG CUGAUGAG X CGAA IGAGGCA	
946	CCUCCAC U UCAACCA		UGGUUGA CUGAUGAG X CGAA IUGGAGG	
949	CCACUUC A ACCACAG		CUGUGGU CUGAUGAG X CGAA IAAGUGG	
952	CUUCAAC C ACAGUGG		CCACUGU CUGAUGAG X CGAA IUUGAAG	
953	UUCAACC A CAGUGGC		GCCACUG CUGAUGAG X CGAA IGUUGAA	
955	CAACCAC A GUGGCAU		AUGCCAC CUGAUGAG X CGAA IUGGUUG	
961	CAGUGGC A UCUGUGA		UCACAGA CUGAUGAG X CGAA ICCACUG	
964	UGGCAUC U GUGAGCU		AGCUCAC CUGAUGAG X CGAA IAUGCCA	
971	UGUGAGC U GCACUGC		GCAGUGC CUGAUGAG X CGAA ICUCACA	
974	GAGCUGC A CUGCCCA		UGGGCAG CUGAUGAG X CGAA ICAGCUC	
976	GCUGCAC U GCCCAGC		GCUGGGC CUGAUGAG X CGAA IUGCAGC	
979	GCACUGC C CAGCCCU		AGGGCUG CUGAUGAG X CGAA ICAGUGC	
980	CACUGCC C AGCCCUG		CAGGGCU CUGAUGAG X CGAA IGCAGUG	
981	ACUGCCC A GCCCUGG		CCAGGGC CUGAUGAG X CGAA IGGCAGU	
984	GCCCAGC C CUGGUCA		UGACCAG CUGAUGAG X CGAA ICUGGGC	
985	CCCAGCC C UGGUCAC		GUGACCA CUGAUGAG X CGAA IGCUGGG	
986	CCAGCCC U GGUCACC		GGUGACC CUGAUGAG X CGAA IGGCUGG	
991	CCUGGUC A CCUACAA		UUGUAGG CUGAUGAG X CGAA IACCAGG	
993	UGGUCAC C UACAACA		UGUUGUA CUGAUGAG X CGAA IUGACCA	
994	GGUCACC U ACAACAC		GUGUUGU CUGAUGAG X CGAA IGUGACC	
997	CACCUAC A ACACAGA		UCUGUGU CUGAUGAG X CGAA IUAGGUG	
1000	CUACAAC A CAGACAC		GUGUCUG CUGAUGAG X CGAA IUUGUAG	
1002	ACAACAC A GACACGU		ACGUGUC CUGAUGAG X CGAA IUGUUGU	
1006	CACAGAC A CGUUUGA		UCAAACG CUGAUGAG X CGAA IUCUGUG	
1017	UUGAGUC C AUGCCCA		UGGGCAU CUGAUGAG X CGAA IACUCAA	
1018	UGAGUCC A UGCCCAA		UUGGGCA CUGAUGAG X CGAA IGACUCA	
1022	UCCAUGC C CAAUCCC		GGGAUUG CUGAUGAG X CGAA ICAUGGA	
1023	CCAUGCC C AAUCCCG		CGGGAUU CUGAUGAG X CGAA IGCAUGG	
1024	CAUGCCC A AUCCCGA		UCGGGAU CUGAUGAG X CGAA IGGCAUG	
1028	CCCAAUC C CGAGGGC		GCCCUCG CUGAUGAG X CGAA IAUUGGG	
1029	CCAAUCC C GAGGGCC		GGCCCUC CUGAUGAG X CGAA IGAUUGG	

Table 34

1036	CGAGGGC C GGUAUAC		GUAUACC CUGAUGAG X CGAA ICCCUCG	
1044	GGUAUAC A UUCGGCG		CGCCGAA CUGAUGAG X CGAA IUAUACC	
1053	UCGGCGC C AGCUGUG		CACAGCU CUGAUGAG X CGAA ICGCCGA	
1054	CGGCGCC A GCUGUGU		ACACAGC CUGAUGAG X CGAA IGCGCCG	
1057	CGCCAGC U GUGUGAC		GUCACAC CUGAUGAG X CGAA ICUGGCG	
1065	GUGUGAC U GCCUGUC		GACAGGC CUGAUGAG X CGAA IUCACAC	
1068	UGACUGC C UGUCCCU		AGGGACA CUGAUGAG X CGAA ICAGUCA	
1069	GACUGCC U GUCCCUA		UAGGGAC CUGAUGAG X CGAA IGCAGUC	
1073	GCCUGUC C CUACAAC		GUUGUAG CUGAUGAG X CGAA IACAGGC	
1074	CCUGUCC C UACAACU		AGUUGUA CUGAUGAG X CGAA IGACAGG	
1075	CUGUCCC U ACAACUA		UAGUUGU CUGAUGAG X CGAA IGGACAG	
1078	UCCCUAC A ACUACCU		AGGUAGU CUGAUGAG X CGAA IUAGGGA	
1081	CUACAAC U ACCUUUC		GAAAGGU CUGAUGAG X CGAA IUUGUAG	
1084	CAACUAC C UUUCUAC		GUAGAAA CUGAUGAG X CGAA IUAGUUG	
1085	AACUACC U UUCUACG		CGUAGAA CUGAUGAG X CGAA IGUAGUU	
1089	ACCUUUC U ACGGACG		CGUCCGU CUGAUGAG X CGAA IAAAGGU	
1104	UGGGAUC C UGCACCC		GGGUGCA CUGAUGAG X CGAA IAUCCCA	
1105	GGGAUCC U GCACCCU		AGGGUGC CUGAUGAG X CGAA IGAUCCC	
1108	AUCCUGC A CCCUCGU		ACGAGGG CUGAUGAG X CGAA ICAGGAU	
1110	CCUGCAC C CUCGUCU		AGACGAG CUGAUGAG X CGAA IUGCAGG	
1111	CUGCACC C UCGUCUG		CAGACGA CUGAUGAG X CGAA IGUGCAG	
1112	UGCACCC U CGUCUGC		GCAGACG CUGAUGAG X CGAA IGGUGCA	
1117	CCUCGUC U GCCCCCU		AGGGGGC CUGAUGAG X CGAA IACGAGG	
1120	CGUCUGC C CCCUGCA		UGCAGGG CUGAUGAG X CGAA ICAGACG	
1121	GUCUGCC C CCUGCAC		GUGCAGG CUGAUGAG X CGAA IGCAGAC	
1122	UCUGCCC C CUGCACA		UGUGCAG CUGAUGAG X CGAA IGGCAGA	
1123	CUGCCCC C UGCACAA		UUGUGCA CUGAUGAG X CGAA IGGGCAG	
1124	UGCCCCC U GCACAAC		GUUGUGC CUGAUGAG X CGAA IGGGGCA	
1127	CCCCUGC A CAACCAA		UUGGUUG CUGAUGAG X CGAA ICAGGGG	
1129	CCUGCAC A ACCAAGA		UCUUGGU CUGAUGAG X CGAA IUGCAGG	
1132	GCACAAC C AAGAGGU		ACCUCUU CUGAUGAG X CGAA IUUGUGC	
1133	CACAACC A AGAGGUG		CACCUCU CUGAUGAG X CGAA IGUUGUG	
1143	AGGUGAC A GCAGAGG		CCUCUGC CUGAUGAG X CGAA IUCACCU	
1146	UGACAGC A GAGGAUG		CAUCCUC CUGAUGAG X CGAA ICUGUCA	
1158	AUGGAAC A CAGCGGU		ACCGCUG CUGAUGAG X CGAA IUUCCAU	
1160	GGAACAC A GCGGUGU		ACACCGC CUGAUGAG X CGAA IUGUUCC	
1177	GAAGUGC A GCAAGCC		GGCUUGC CUGAUGAG X CGAA ICACUUC	
1180	GUGCAGC A AGCCCUG		CAGGGCU CUGAUGAG X CGAA ICUGCAC	
1184	AGCAAGC C CUGUGCC		GGCACAG CUGAUGAG X CGAA ICUUGCU	
1185	GCAAGCC C UGUGCCC		GGGCACA CUGAUGAG X CGAA IGCUUGC	
1186	CAAGCCC U GUGCCCG		CGGGCAC CUGAUGAG X CGAA IGGCUUG	
1191	CCUGUGC C CGAGUGU		ACACUCG CUGAUGAG X CGAA ICACAGG	
1192	CUGUGCC C GAGUGUG		CACACUC CUGAUGAG X CGAA IGCACAG	
1201	AGUGUGC U AUGGUCU		AGACCAU CUGAUGAG X CGAA ICACACU	
1208	UAUGGUC U GGGCAUG		CAUGCCC CUGAUGAG X CGAA IACCAUA	
1213	UCUGGGC A UGGAGCA		UGCUCCA CUGAUGAG X CGAA ICCCAGA	
1220	AUGGAGC A CUUGCGA		UCGCAAG CUGAUGAG X CGAA ICUCCAU	

Table 34

1222	GGAGCAC U UGCGAGA		UCUCGCA CUGAUGAG X CGAA IUGCUCC	
1239	UGAGGGC A GUUACCA		UGGUAAC CUGAUGAG X CGAA ICCCUCA	
1245	CAGUUAC C AGUGCCA		UGGCACU CUGAUGAG X CGAA IUAACUG	
1246	AGUUACC A GUGCCAA		UUGGCAC CUGAUGAG X CGAA IGUAACU	
1251	CCAGUGC C AAUAUCC		GGAUAUU CUGAUGAG X CGAA ICACUGG	
1252	CAGUGCC A AUAUCCA		UGGAUAU CUGAUGAG X CGAA IGCACUG	
1258	CAAUAUC C AGGAGUU		AACUCCU CUGAUGAG X CGAA IAUAUUG	
1259	AAUAUCC A GGAGUUU		AAACUCC CUGAUGAG X CGAA IGAUAUU	
1269	AGUUUGC U GGCUGCA		UGCAGCC CUGAUGAG X CGAA ICAAACU	
1273	UGCUGGC U GCAAGAA		UUCUUGC CUGAUGAG X CGAA ICCAGCA	
1276	UGGCUGC A AGAAGAU		AUCUUCU CUGAUGAG X CGAA ICAGCCA	
1285	GAAGAUC U UUGGGAG		CUCCCAA CUGAUGAG X CGAA IAUCUUC	
1294	UGGGAGC C UGGCAUU		AAUGCCA CUGAUGAG X CGAA ICUCCCA	
1295	GGGAGCC U GGCAUUU		AAAUGCC CUGAUGAG X CGAA IGCUCCC	
1299	GCCUGGC A UUUCUGC		GCAGAAA CUGAUGAG X CGAA ICCAGGC	
1304	GCAUUUC U GCCGGAG		CUCCGGC CUGAUGAG X CGAA IAAAUGC	
1307	UUUCUGC C GGAGAGC		GCUCUCC CUGAUGAG X CGAA ICAGAAA	
1315	GGAGAGC U UUGAUGG		CCAUCAA CUGAUGAG X CGAA ICUCUCC	
1327	UGGGGAC C CAGCCUC		GAGGCUG CUGAUGAG X CGAA IUCCCCA	
1328	GGGGACC C AGCCUCC		GGAGGCU CUGAUGAG X CGAA IGUCCCC	
1329	GGGACCC A GCCUCCA		UGGAGGC CUGAUGAG X CGAA IGGUCCC	
1332	ACCCAGC C UCCAACA		UGUUGGA CUGAUGAG X CGAA ICUGGGU	
1333	CCCAGCC U CCAACAC		GUGUUGG CUGAUGAG X CGAA IGCUGGG	
1335	CAGCCUC C AACACUG		CAGUGUU CUGAUGAG X CGAA IAGGCUG	
1336	AGCCUCC A ACACUGC		GCAGUGU CUGAUGAG X CGAA IGAGGCU	
1339	CUCCAAC A CUGCCCC		GGGGCAG CUGAUGAG X CGAA IUUGGAG	
1341	CCAACAC U GCCCCGC		GCGGGGC CUGAUGAG X CGAA IUGUUGG	
1344	ACACUGC C CCGCUCC		GGAGCGG CUGAUGAG X CGAA ICAGUGU	
1345	CACUGCC C CGCUCCA		UGGAGCG CUGAUGAG X CGAA IGCAGUG	
1346	ACUGCCC C GCUCCAG		CUGGAGC CUGAUGAG X CGAA IGGCAGU	
1349	GCCCCGC U CCAGCCA		UGGCUGG CUGAUGAG X CGAA ICGGGGC	
1351	CCCGCUC C AGCCAGA		UCUGGCU CUGAUGAG X CGAA IAGCGGG	
1352	CCGCUCC A GCCAGAG		CUCUGGC CUGAUGAG X CGAA IGAGCGG	
1355	CUCCAGC C AGAGCAG		CUGCUCU CUGAUGAG X CGAA ICUGGAG	
1356	UCCAGCC A GAGCAGC		GCUGCUC CUGAUGAG X CGAA IGCUGGA	
1361	CCAGAGC A GCUCCAA		UUGGAGC CUGAUGAG X CGAA ICUCUGG	
1364	GAGCAGC U CCAAGUG		CACUUGG CUGAUGAG X CGAA ICUGCUC	
1366	GCAGCUC C AAGUGUU		AACACUU CUGAUGAG X CGAA IAGCUGC	
1367	CAGCUCC A AGUGUUU		AAACACU CUGAUGAG X CGAA IGAGCUG	
1380	UUGAGAC U CUGGAAG		CUUCCAG CUGAUGAG X CGAA IUCUCAA	
1382	GAGACUC U GGAAGAG		CUCUUCC CUGAUGAG X CGAA IAGUCUC	
1393	AGAGAUC A CAGGUUA		UAACCUG CUGAUGAG X CGAA IAUCUCU	
1395	AGAUCAC A GGUUACC		GGUAACC CUGAUGAG X CGAA IUGAUCU	
1402	AGGUUAC C UAUACAU		AUGUAUA CUGAUGAG X CGAA IUAACCU	
1403	GGUUACC U AUACAUC		GAUGUAU CUGAUGAG X CGAA IGUAACC	
1408	CCUAUAC A UCUCAGC		GCUGAGA CUGAUGAG X CGAA IUAUAGG	
1411	AUACAUC U CAGCAUG		CAUGCUG CUGAUGAG X CGAA IAUGUAU	

Table 34

1413	ACAUCUC A GCAUGGC		GCCAUGC CUGAUGAG X CGAA IAGAUGU	
1416	UCUCAGC A UGGCCGG		CCGGCCA CUGAUGAG X CGAA ICUGAGA	
1421	GCAUGGC C GGACAGC		GCUGUCC CUGAUGAG X CGAA ICCAUGC	
1426	GCCGGAC A GCCUGCC		GGCAGGC CUGAUGAG X CGAA IUCCGGC	
1429	GGACAGC C UGCCUGA		UCAGGCA CUGAUGAG X CGAA ICUGUCC	
1430	GACAGCC U GCCUGAC		GUCAGGC CUGAUGAG X CGAA IGCUGUC	
1433	AGCCUGC C UGACCUC		GAGGUCA CUGAUGAG X CGAA ICAGGCU	
1434	GCCUGCC U GACCUCA		UGAGGUC CUGAUGAG X CGAA IGCAGGC	
1438	GCCUGAC C UCAGCGU		ACGCUGA CUGAUGAG X CGAA IUCAGGC	
1439	CCUGACC U CAGCGUC		GACGCUG CUGAUGAG X CGAA IGUCAGG	
1441	UGACCUC A GCGUCUU		AAGACGC CUGAUGAG X CGAA IAGGUCA	
1447	CAGCGUC U UCCAGAA		UUCUGGA CUGAUGAG X CGAA IACGCUG	
1450	CGUCUUC C AGAACCU		AGGUUCU CUGAUGAG X CGAA IAAGACG	
1451	GUCUUCC A GAACCUG		CAGGUUC CUGAUGAG X CGAA IGAAGAC	
1456	CCAGAAC C UGCAAGU		ACUUGCA CUGAUGAG X CGAA IUUCUGG	
1457	CAGAACC U GCAAGUA		UACUUGC CUGAUGAG X CGAA IGUUCUG	
1460	AACCUGC A AGUAAUC		GAUUACU CUGAUGAG X CGAA ICAGGUU	
1468	AGUAAUC C GGGGACG		CGUCCCC CUGAUGAG X CGAA IAUUACU	
1481	CGAAUUC U GCACAAU		AUUGUGC CUGAUGAG X CGAA IAAUUCG	
1484	AUUCUGC A CAAUGGC		GCCAUUG CUGAUGAG X CGAA ICAGAAU	
1486	UCUGCAC A AUGGCGC		GCGCCAU CUGAUGAG X CGAA IUGCAGA	
1494	AUGGCGC C UACUCGC		GCGAGUA CUGAUGAG X CGAA ICGCCAU	
1495	UGGCGCC U ACUCGCU		AGCGAGU CUGAUGAG X CGAA IGCGCCA	
1498	CGCCUAC U CGCUGAC		GUCAGCG CUGAUGAG X CGAA IUAGGCG	
1502	UACUCGC U GACCCUG		CAGGGUC CUGAUGAG X CGAA ICGAGUA	
1506	CGCUGAC C CUGCAAG		CUUGCAG CUGAUGAG X CGAA IUCAGCG	
1507	GCUGACC C UGCAAGG		CCUUGCA CUGAUGAG X CGAA IGUCAGC	
1508	CUGACCC U GCAAGGG		CCCUUGC CUGAUGAG X CGAA IGGUCAG	
1511	ACCCUGC A AGGGCUG		CAGCCCU CUGAUGAG X CGAA ICAGGGU	
1517	CAAGGGC U GGGCAUC		GAUGCCC CUGAUGAG X CGAA ICCCUUG	
1522	GCUGGGC A UCAGCUG		CAGCUGA CUGAUGAG X CGAA ICCCAGC	
1525	GGGCAUC A GCUGGCU		AGCCAGC CUGAUGAG X CGAA IAUGCCC	
1528	CAUCAGC U GGCUGGG		CCCAGCC CUGAUGAG X CGAA ICUGAUG	
1532	AGCUGGC U GGGGCUG		CAGCCCC CUGAUGAG X CGAA ICCAGCU	
1538	CUGGGGC U GCGCUCA		UGAGCGC CUGAUGAG X CGAA ICCCCAG	
1543	GCUGCGC U CACUGAG		CUCAGUG CUGAUGAG X CGAA ICGCAGC	
1545	UGCGCUC A CUGAGGG		CCCUCAG CUGAUGAG X CGAA IAGCGCA	
1547	CGCUCAC U GAGGGAA		UUCCCUC CUGAUGAG X CGAA IUGAGCG	
1556	AGGGAAC U GGGCAGU		ACUGCCC CUGAUGAG X CGAA IUUCCCU	
1561	ACUGGGC A GUGGACU		AGUCCAC CUGAUGAG X CGAA ICCCAGU	
1568	AGUGGAC U GGCCCUC		GAGGGCC CUGAUGAG X CGAA IUCCACU	
1572	GACUGGC C CUCAUCC		GGAUGAG CUGAUGAG X CGAA ICCAGUC	
1573	ACUGGCC C UCAUCCA		UGGAUGA CUGAUGAG X CGAA IGCCAGU	
1574	CUGGCCC U CAUCCAC		GUGGAUG CUGAUGAG X CGAA IGGCCAG	
1576	GGCCCUC A UCCACCA		UGGUGGA CUGAUGAG X CGAA IAGGGCC	
1579	CCUCAUC C ACCAUAA		UUAUGGU CUGAUGAG X CGAA IAUGAGG	
1580	CUCAUCC A CCAUAAC		GUUAUGG CUGAUGAG X CGAA IGAUGAG	

Table 34

1582	CAUCCAC C AUAACAC		GUGUUAU CUGAUGAG X CGAA IUGGAUG	
1583	AUCCACC A UAACACC		GGUGUUA CUGAUGAG X CGAA IGUGGAU	
1588	CCAUAAC A CCCACCU		AGGUGGG CUGAUGAG X CGAA IUUAUGG	
1590	AUAACAC C CACCUCU		AGAGGUG CUGAUGAG X CGAA IUGUUAU	
1591	UAACACC C ACCUCUG		CAGAGGU CUGAUGAG X CGAA IGUGUUA	
1592	AACACCC A CCUCUGC		GCAGAGG CUGAUGAG X CGAA IGGUGUU	
1594	CACCCAC C UCUGCUU		AAGCAGA CUGAUGAG X CGAA IUGGGUG	
1595	ACCCACC U CUGCUUC		GAAGCAG CUGAUGAG X CGAA IGUGGGU	
1597	CCACCUC U GCUUCGU		ACGAAGC CUGAUGAG X CGAA IAGGUGG	
1600	CCUCUGC U UCGUGCA		UGCACGA CUGAUGAG X CGAA ICAGAGG	
1607	UUCGUGC A CACGGUG		CACCGUG CUGAUGAG X CGAA ICACGAA	
1609	CGUGCAC A CGGUGCC		GGCACCG CUGAUGAG X CGAA IUGCACG	
1616	ACGGUGC C CUGGGAC		GUCCCAG CUGAUGAG X CGAA ICACCGU	
1617	CGGUGCC C UGGGACC		GGUCCCA CUGAUGAG X CGAA IGCACCG	
1618	GGUGCCC U GGGACCA		UGGUCCC CUGAUGAG X CGAA IGGCACC	
1624	CUGGGAC C AGCUCUU		AAGAGCU CUGAUGAG X CGAA IUCCCAG	
1625	UGGGACC A GCUCUUU		AAAGAGC CUGAUGAG X CGAA IGUCCCA	
1628	GACCAGC U CUUUCGG		CCGAAAG CUGAUGAG X CGAA ICUGGUC	
1630	CCAGCUC U UUCGGAA		UUCCGAA CUGAUGAG X CGAA IAGCUGG	
1639	UCGGAAC C CGCACCA		UGGUGCG CUGAUGAG X CGAA IUUCCGA	
1640	CGGAACC C GCACCAA		UUGGUGC CUGAUGAG X CGAA IGUUCCG	
1643	AACCCGC A CCAAGCU		AGCUUGG CUGAUGAG X CGAA ICGGGUU	
1645	CCCGCAC C AAGCUCU		AGAGCUU CUGAUGAG X CGAA IUGCGGG	
1646	CCGCACC A AGCUCUG		CAGAGCU CUGAUGAG X CGAA IGUGCGG	
1650	ACCAAGC U CUGCUCC		GGAGCAG CUGAUGAG X CGAA ICUUGGU	
1652	CAAGCUC U GCUCCAC		GUGGAGC CUGAUGAG X CGAA IAGCUUG	
1655	GCUCUGC U CCACACU		AGUGUGG CUGAUGAG X CGAA ICAGAGC	
1657	UCUGCUC C ACACUGC		GCAGUGU CUGAUGAG X CGAA IAGCAGA	
1658	CUGCUCC A CACUGCC		GGCAGUG CUGAUGAG X CGAA IGAGCAG	
1660	GCUCCAC A CUGCCAA		UUGGCAG CUGAUGAG X CGAA IUGGAGC	
1662	UCCACAC U GCCAACC		GGUUGGC CUGAUGAG X CGAA IUGUGGA	
1665	ACACUGC C AACCGGC		GCCGGUU CUGAUGAG X CGAA ICAGUGU	
1666	CACUGCC A ACCGGCC		GGCCGGU CUGAUGAG X CGAA IGCAGUG	
1669	UGCCAAC C GGCCAGA		UCUGGCC CUGAUGAG X CGAA IUUGGCA	
1673	AACCGGC C AGAGGAC		GUCCUCU CUGAUGAG X CGAA ICCGGUU	
1674	ACCGGCC A GAGGACG		CGUCCUC CUGAUGAG X CGAA IGCCGGU	
1699	CGAGGGC C UGGCCUG		CAGGCCA CUGAUGAG X CGAA ICCCUCG	
1700	GAGGGCC U GGCCUGC		GCAGGCC CUGAUGAG X CGAA IGCCCUC	
1704	GCCUGGC C UGCCACC		GGUGGCA CUGAUGAG X CGAA ICCAGGC	
1705	CCUGGCC U GCCACCA		UGGUGGC CUGAUGAG X CGAA IGCCAGG	
1708	GGCCUGC C ACCAGCU		AGCUGGU CUGAUGAG X CGAA ICAGGCC	
1709	GCCUGCC A CCAGCUG		CAGCUGG CUGAUGAG X CGAA IGCAGGC	
1711	CUGCCAC C AGCUGUG		CACAGCU CUGAUGAG X CGAA IUGGCAG	
1712	UGCCACC A GCUGUGC		GCACAGC CUGAUGAG X CGAA IGUGGCA	
1715	CACCAGC U GUGCGCC		GGCGCAC CUGAUGAG X CGAA ICUGGUG	
1722	UGUGCGC C CGAGGGC		GCCCUCG CUGAUGAG X CGAA ICGCACA	
1723	GUGCGCC C GAGGGCA		UGCCCUC CUGAUGAG X CGAA IGCGCAC	

Table 34

1730	CGAGGGC A CUGCUGG		CCAGCAG CUGAUGAG X CGAA ICCCUCG	
1732	AGGGCAC U GCUGGGG		CCCCAGC CUGAUGAG X CGAA IUGCCCU	
1735	GCACUGC U GGGGUCC		GGACCCC CUGAUGAG X CGAA ICAGUGC	
1742	UGGGGUC C AGGGCCC		GGGCCCU CUGAUGAG X CGAA IACCCCA	
1743	GGGGUCC A GGGCCCA		UGGGCCC CUGAUGAG X CGAA IGACCCC	
1748	CCAGGGC C CACCCAG		CUGGGUG CUGAUGAG X CGAA ICCCUGG	
1749	CAGGGCC C ACCCAGU		ACUGGGU CUGAUGAG X CGAA IGCCCUG	
1750	AGGGCCC A CCCAGUG		CACUGGG CUGAUGAG X CGAA IGGCCCU	
1752	GGCCCAC C CAGUGUG		CACACUG CUGAUGAG X CGAA IUGGGCC	
1753	GCCCACC C AGUGUGU		ACACACU CUGAUGAG X CGAA IGUGGGC	
1754	CCCACCC A GUGUGUC		GACACAC CUGAUGAG X CGAA IGGUGGG	
1762	GUGUGUC A ACUGCAG		CUGCAGU CUGAUGAG X CGAA IACACAC	
1765	UGUCAAC U GCAGCCA		UGGCUGC CUGAUGAG X CGAA IUUGACA	
1768	CAACUGC A GCCAGUU		AACUGGC CUGAUGAG X CGAA ICAGUUG	
1771	CUGCAGC C AGUUCCU		AGGAACU CUGAUGAG X CGAA ICUGCAG	
1772	UGCAGCC A GUUCCUU		AAGGAAC CUGAUGAG X CGAA IGCUGCA	
1777	CCAGUUC C UUCGGGG		CCCCGAA CUGAUGAG X CGAA IAACUGG	
1778	CAGUUCC U UCGGGGC		GCCCCGA CUGAUGAG X CGAA IGAACUG	
1786	UCGGGGC C AGGAGUG		CACUCCU CUGAUGAG X CGAA ICCCCGA	
1787	CGGGGCC A GGAGUGC		GCACUCC CUGAUGAG X CGAA IGCCCCG	
1807	GGAAUGC C GAGUACU		AGUACUC CUGAUGAG X CGAA ICAUUCC	
1814	CGAGUAC U GCAGGGG		CCCCUGC CUGAUGAG X CGAA IUACUCG	
1817	GUACUGC A GGGGCUC		GAGCCCC CUGAUGAG X CGAA ICAGUAC	
1823	CAGGGGC U CCCCAGG		CCUGGGG CUGAUGAG X CGAA ICCCCUG	
1825	GGGGCUC C CCAGGGA		UCCCUGG CUGAUGAG X CGAA IAGCCCC	
1826	GGGCUCC C CAGGGAG		CUCCCUG CUGAUGAG X CGAA IGAGCCC	
1827	GGCUCCC C AGGGAGU		ACUCCCU CUGAUGAG X CGAA IGGAGCC	
1828	GCUCCCC A GGGAGUA		UACUCCC CUGAUGAG X CGAA IGGGAGC	
1845	UGAAUGC C AGGCACU		AGUGCCU CUGAUGAG X CGAA ICAUUCA	
1846	GAAUGCC A GGCACUG		CAGUGCC CUGAUGAG X CGAA IGCAUUC	
1850	GCCAGGC A CUGUUUG		CAAACAG CUGAUGAG X CGAA ICCUGGC	
1852	CAGGCAC U GUUUGCC		GGCAAAC CUGAUGAG X CGAA IUGCCUG	
1859	UGUUUGC C GUGCCAC		GUGGCAC CUGAUGAG X CGAA ICAAACA	
1864	GCCGUGC C ACCCUGA		UCAGGGU CUGAUGAG X CGAA ICACGGC	
1865	CCGUGCC A CCCUGAG		CUCAGGG CUGAUGAG X CGAA IGCACGG	
1867	GUGCCAC C CUGAGUG		CACUCAG CUGAUGAG X CGAA IUGGCAC	
1868	UGCCACC C UGAGUGU		ACACUCA CUGAUGAG X CGAA IGUGGCA	
1869	GCCACCC U GAGUGUC		GACACUC CUGAUGAG X CGAA IGGUGGC	
1877	GAGUGUC A GCCCCAG		CUGGGGC CUGAUGAG X CGAA IACACUC	
1880	UGUCAGC C CCAGAAU		AUUCUGG CUGAUGAG X CGAA ICUGACA	
1881	GUCAGCC C CAGAAUG		CAUUCUG CUGAUGAG X CGAA IGCUGAC	
1882	UCAGCCC C AGAAUGG		CCAUUCU CUGAUGAG X CGAA IGGCUGA	
1883	CAGCCCC A GAAUGGC		GCCAUUC CUGAUGAG X CGAA IGGGCUG	
1891	GAAUGGC U CAGUGAC		GUCACUG CUGAUGAG X CGAA ICCAUUC	
1893	AUGGCUC A GUGACCU		AGGUCAC CUGAUGAG X CGAA IAGCCAU	
1899	CAGUGAC C UGUUUUG		CAAAACA CUGAUGAG X CGAA IUCACUG	
1900	AGUGACC U GUUUUGG		CCAAAAC CUGAUGAG X CGAA IGUCACU	

Table 34

1910	UUUGGAC C GGAGGCU		AGCCUCC CUGAUGAG X CGAA IUCCAAA	
1917	CGGAGGC U GACCAGU		ACUGGUC CUGAUGAG X CGAA ICCUCCG	
1921	GGCUGAC C AGUGUGU		ACACACU CUGAUGAG X CGAA IUCAGCC	
1922	GCUGACC A GUGUGUG		CACACAC CUGAUGAG X CGAA IGUCAGC	
1932	GUGUGGC C UGUGCCC		GGGCACA CUGAUGAG X CGAA ICCACAC	
1933	UGUGGCC U GUGCCCA		UGGGCAC CUGAUGAG X CGAA IGCCACA	
1938	CCUGUGC C CACUAUA		UAUAGUG CUGAUGAG X CGAA ICACAGG	
1939	CUGUGCC C ACUAUAA		UUAUAGU CUGAUGAG X CGAA IGCACAG	
1940	UGUGCCC A CUAUAAG		CUUAUAG CUGAUGAG X CGAA IGGCACA	
1942	UGCCCAC U AUAAGGA		UCCUUAU CUGAUGAG X CGAA IUGGGCA	
1951	UAAGGAC C CUCCCUU		AAGGGAG CUGAUGAG X CGAA IUCCUUA	
1952	AAGGACC C UCCCUUC		GAAGGGA CUGAUGAG X CGAA IGUCCUU	
1953	AGGACCC U CCCUUCU		AGAAGGG CUGAUGAG X CGAA IGGUCCU	
1955	GACCCUC C CUUCUGC		GCAGAAG CUGAUGAG X CGAA IAGGGUC	
1956	ACCCUCC C UUCUGCG		CGCAGAA CUGAUGAG X CGAA IGAGGGU	
1957	CCCUCCC U UCUGCGU		ACGCAGA CUGAUGAG X CGAA IGGAGGG	
1960	UCCCUUC U GCGUGGC		GCCACGC CUGAUGAG X CGAA IAAGGGA	
1968	GCGUGGC C CGCUGCC		GGCAGCG CUGAUGAG X CGAA ICCACGC	
1969	CGUGGCC C GCUGCCC		GGGCAGC CUGAUGAG X CGAA IGCCACG	
1972	GGCCCGC U GCCCCAG		CUGGGGC CUGAUGAG X CGAA ICGGGCC	
1975	CCGCUGC C CCAGCGG		CCGCUGG CUGAUGAG X CGAA ICAGCGG	
1976	CGCUGCC C CAGCGGU		ACCGCUG CUGAUGAG X CGAA IGCAGCG	
1977	GCUGCCC C AGCGGUG		CACCGCU CUGAUGAG X CGAA IGGCAGC	
1978	CUGCCCC A GCGGUGU		ACACCGC CUGAUGAG X CGAA IGGGCAG	
1991	GUGAAAC C UGACCUC		GAGGUCA CUGAUGAG X CGAA IUUUCAC	
1992	UGAAACC U GACCUCU		AGAGGUC CUGAUGAG X CGAA IGUUUCA	
1996	ACCUGAC C UCUCCUA		UAGGAGA CUGAUGAG X CGAA IUCAGGU	
1997	CCUGACC U CUCCUAC		GUAGGAG CUGAUGAG X CGAA IGUCAGG	
1999	UGACCUC U CCUACAU		AUGUAGG CUGAUGAG X CGAA IAGGUCA	
2001	ACCUCUC C UACAUGC		GCAUGUA CUGAUGAG X CGAA IAGAGGU	
2002	CCUCUCC U ACAUGCC		GGCAUGU CUGAUGAG X CGAA IGAGAGG	
2005	CUCCUAC A UGCCCAU		AUGGGCA CUGAUGAG X CGAA IUAGGAG	
2009	UACAUGC C CAUCUGG		CCAGAUG CUGAUGAG X CGAA ICAUGUA	
2010	ACAUGCC C AUCUGGA		UCCAGAU CUGAUGAG X CGAA IGCAUGU	
2011	CAUGCCC A UCUGGAA		UUCCAGA CUGAUGAG X CGAA IGGCAUG	
2014	GCCCAUC U GGAAGUU		AACUUCC CUGAUGAG X CGAA IAUGGGC	
2024	AAGUUUC C AGAUGAG		CUCAUCU CUGAUGAG X CGAA IAAACUU	
2025	AGUUUCC A GAUGAGG		CCUCAUC CUGAUGAG X CGAA IGAAACU	
2040	AGGGCGC A UGCCAGC		GCUGGCA CUGAUGAG X CGAA ICGCCCU	
2044	CGCAUGC C AGCCUUG		CAAGGCU CUGAUGAG X CGAA ICAUGCG	
2045	GCAUGCC A GCCUUGC		GCAAGGC CUGAUGAG X CGAA IGCAUGC	
2048	UGCCAGC C UUGCCCC		GGGGCAA CUGAUGAG X CGAA ICUGGCA	
2049	GCCAGCC U UGCCCCA		UGGGGCA CUGAUGAG X CGAA IGCUGGC	
2053	GCCUUGC C CCAUCAA		UUGAUGG CUGAUGAG X CGAA ICAAGGC	
2054	CCUUGCC C CAUCAAC		GUUGAUG CUGAUGAG X CGAA IGCAAGG	
2055	CUUGCCC C AUCAACU		AGUUGAU CUGAUGAG X CGAA IGGCAAG	
2056	UUGCCCC A UCAACUG		CAGUUGA CUGAUGAG X CGAA IGGGCAA	

Table 34

2059	CCCCAUC A ACUGCAC		GUGCAGU CUGAUGAG X CGAA IAUGGGG	
2062	CAUCAAC U GCACCCA		UGGGUGC CUGAUGAG X CGAA IUUGAUG	
2065	CAACUGC A CCCACUC		GAGUGGG CUGAUGAG X CGAA ICAGUUG	
2067	ACUGCAC C CACUCCU		AGGAGUG CUGAUGAG X CGAA IUGCAGU	
2068	CUGCACC C ACUCCUG		CAGGAGU CUGAUGAG X CGAA IGUGCAG	
2069	UGCACCC A CUCCUGU		ACAGGAG CUGAUGAG X CGAA IGGUGCA	
2071	CACCCAC U CCUGUGU		ACACAGG CUGAUGAG X CGAA IUGGGUG	
2073	CCCACUC C UGUGUGG		CCACACA CUGAUGAG X CGAA IAGUGGG	
2074	CCACUCC U GUGUGGA		UCCACAC CUGAUGAG X CGAA IGAGUGG	
2083	UGUGGAC C UGGAUGA		UCAUCCA CUGAUGAG X CGAA IUCCACA	
2084	GUGGACC U GGAUGAC		GUCAUCC CUGAUGAG X CGAA IGUCCAC	
2092	GGAUGAC A AGGGCUG		CAGCCCU CUGAUGAG X CGAA IUCAUCC	
2098	CAAGGGC U GCCCCGC		GCGGGGC CUGAUGAG X CGAA ICCCUUG	
2101	GGGCUGC C CCGCCGA		UCGGCGG CUGAUGAG X CGAA ICAGCCC	
2102	GGCUGCC C CGCCGAG		CUCGGCG CUGAUGAG X CGAA IGCAGCC	
2103	GCUGCCC C GCCGAGC		GCUCGGC CUGAUGAG X CGAA IGGCAGC	
2106	GCCCCGC C GAGCAGA		UCUGCUC CUGAUGAG X CGAA ICGGGGC	
2111	GCCGAGC A GAGAGCC		GGCUCUC CUGAUGAG X CGAA ICUCGGC	
2118	AGAGAGC C AGCCCUC		GAGGGCU CUGAUGAG X CGAA ICUCUCU	
2119	GAGAGCC A GCCCUCU		AGAGGGC CUGAUGAG X CGAA IGCUCUC	
2122	AGCCAGC C CUCUGAC		GUCAGAG CUGAUGAG X CGAA ICUGGCU	
2123	GCCAGCC C UCUGACG		CGUCAGA CUGAUGAG X CGAA IGCUGGC	
2124	CCAGCCC U CUGACGU		ACGUCAG CUGAUGAG X CGAA IGGCUGG	
2126	AGCCCUC U GACGUCC		GGACGUC CUGAUGAG X CGAA IAGGGCU	
2133	UGACGUC C AUCAUCU		AGAUGAU CUGAUGAG X CGAA IACGUCA	
2134	GACGUCC A UCAUCUC		GAGAUGA CUGAUGAG X CGAA IGACGUC	
2137	GUCCAUC A UCUCUGC		GCAGAGA CUGAUGAG X CGAA IAUGGAC	
2140	CAUCAUC U CUGCGGU		ACCGCAG CUGAUGAG X CGAA IAUGAUG	
2142	UCAUCUC U GCGGUGG		CCACCGC CUGAUGAG X CGAA IAGAUGA	
2155	GGUUGGC A UUCUGCU		AGCAGAA CUGAUGAG X CGAA ICCAACC	
2159	GGCAUUC U GCUGGUC		GACCAGC CUGAUGAG X CGAA IAAUGCC	
2162	AUUCUGC U GGUCGUG		CACGACC CUGAUGAG X CGAA ICAGAAU	
2173	CGUGGUC U UGGGGGU		ACCCCCA CUGAUGAG X CGAA IACCACG	
2185	GGUGGUC U UUGGGAU		AUCCCAA CUGAUGAG X CGAA IACCACC	
2194	UGGGAUC C UCAUCAA		UUGAUGA CUGAUGAG X CGAA IAUCCCA	
2195	GGGAUCC U CAUCAAG		CUUGAUG CUGAUGAG X CGAA IGAUCCC	
2197	GAUCCUC A UCAAGCG		CGCUUGA CUGAUGAG X CGAA IAGGAUC	
2200	CCUCAUC A AGCGACG		CGUCGCU CUGAUGAG X CGAA IAUGAGG	
2210	CGACGGC A GCAGAAG		CUUCUGC CUGAUGAG X CGAA ICCGUCG	
2213	CGGCAGC A GAAGAUC		GAUCUUC CUGAUGAG X CGAA ICUGCCG	
2221	GAAGAUC C GGAAGUA		UACUUCC CUGAUGAG X CGAA IAUCUUC	
2230	GAAGUAC A CGAUGCG		CGCAUCG CUGAUGAG X CGAA IUACUUC	
2243	CGGAGAC U GCUGCAG		CUGCAGC CUGAUGAG X CGAA IUCUCCG	
2246	AGACUGC U GCAGGAA		UUCCUGC CUGAUGAG X CGAA ICAGUCU	
2249	CUGCUGC A GGAAACG		CGUUUCC CUGAUGAG X CGAA ICAGCAG	
2261	ACGGAGC U GGUGGAG		CUCCACC CUGAUGAG X CGAA ICUCCGU	
2270	GUGGAGC C GCUGACA		UGUCAGC CUGAUGAG X CGAA ICUCCAC	

Table 34

2273	GAGCCGC U GACACCU		AGGUGUC CUGAUGAG X CGAA ICGGCUC	
2277	CGCUGAC A CCUAGCG		CGCUAGG CUGAUGAG X CGAA IUCAGCG	
2279	CUGACAC C UAGCGGA		UCCGCUA CUGAUGAG X CGAA IUGUCAG	
2280	UGACACC U AGCGGAG		CUCCGCU CUGAUGAG X CGAA IGUGUCA	
2294	GCGAUGC C CAACCAG		CUGGUUG CUGAUGAG X CGAA ICAUCGC	
2295	CGAUGCC C AACCAGG		CCUGGUU CUGAUGAG X CGAA IGCAUCG	
2296	GAUGCCC A ACCAGGC		GCCUGGU CUGAUGAG X CGAA IGGCAUC	
2299	GCCCAAC C AGGCGCA		UGCGCCU CUGAUGAG X CGAA IUUGGGC	
2300	CCCAACC A GGCGCAG		CUGCGCC CUGAUGAG X CGAA IGUUGGG	
2306	CAGGCGC A GAUGCGG		CCGCAUC CUGAUGAG X CGAA ICGCCUG	
2317	GCGGAUC C UGAAAGA		UCUUUCA CUGAUGAG X CGAA IAUCCGC	
2318	CGGAUCC U GAAAGAG		CUCUUUC CUGAUGAG X CGAA IGAUCCG	
2333	ACGGAGC U GAGGAAG		CUUCCUC CUGAUGAG X CGAA ICUCCGU	
2351	AAGGUGC U UGGAUCU		AGAUCCA CUGAUGAG X CGAA ICACCUU	
2358	UUGGAUC U GGCGCUU		AAGCGCC CUGAUGAG X CGAA IAUCCAA	
2364	CUGGCGC U UUUGGCA		UGCCAAA CUGAUGAG X CGAA ICGCCAG	
2371	UUUUGGC A CAGUCUA		UAGACUG CUGAUGAG X CGAA ICCAAAA	
2373	UUGGCAC A GUCUACA		UGUAGAC CUGAUGAG X CGAA IUGCCAA	
2377	CACAGUC U ACAAGGG		CCCUUGU CUGAUGAG X CGAA IACUGUG	
2380	AGUCUAC A AGGGCAU		AUGCCCU CUGAUGAG X CGAA IUAGACU	
2386	CAAGGGC A UCUGGAU		AUCCAGA CUGAUGAG X CGAA ICCCUUG	
2389	GGGCAUC U GGAUCCC		GGGAUCC CUGAUGAG X CGAA IAUGCCC	
2395	CUGGAUC C CUGAUGG		CCAUCAG CUGAUGAG X CGAA IAUCCAG	
2396	UGGAUCC C UGAUGGG		CCCAUCA CUGAUGAG X CGAA IGAUCCA	
2397	GGAUCCC U GAUGGGG		CCCCAUC CUGAUGAG X CGAA IGGAUCC	
2420	AAAAUUC C AGUGGCC		GGCCACU CUGAUGAG X CGAA IAAUUUU	
2421	AAAUUCC A GUGGCCA		UGGCCAC CUGAUGAG X CGAA IGAAUUU	
2427	CAGUGGC C AUCAAAG		CUUUGAU CUGAUGAG X CGAA ICCACUG	
2428	AGUGGCC A UCAAAGU		ACUUUGA CUGAUGAG X CGAA IGCCACU	
2431	GGCCAUC A AAGUGUU		AACACUU CUGAUGAG X CGAA IAUGGCC	
2449	GGAAAAC A CAUCCCC		GGGGAUG CUGAUGAG X CGAA IUUUUCC	
2451	AAAACAC A UCCCCCA		UGGGGGA CUGAUGAG X CGAA IUGUUUU	
2454	ACACAUC C CCCAAAG		CUUUGGG CUGAUGAG X CGAA IAUGUGU	
2455	CACAUCC C CCAAAGC		GCUUUGG CUGAUGAG X CGAA IGAUGUG	
2456	ACAUCCC C CAAAGCC		GGCUUUG CUGAUGAG X CGAA IGGAUGU	
2457	CAUCCCC C AAAGCCA		UGGCUUU CUGAUGAG X CGAA IGGGAUG	
2458	AUCCCCC A AAGCCAA		UUGGCUU CUGAUGAG X CGAA IGGGGAU	
2463	CCAAAGC C AACAAAG		CUUUGUU CUGAUGAG X CGAA ICUUUGG	
2464	CAAAGCC A ACAAAGA		UCUUUGU CUGAUGAG X CGAA IGCUUUG	
2467	AGCCAAC A AAGAAAU		AUUUCUU CUGAUGAG X CGAA IUUGGCU	
2476	AGAAAUC U UAGACGA		UCGUCUA CUGAUGAG X CGAA IAUUUCU	
2487	ACGAAGC A UACGUGA		UCACGUA CUGAUGAG X CGAA ICUUCGU	
2499	UGAUGGC U GGUGUGG		CCACACC CUGAUGAG X CGAA ICCAUCA	
2509	UGUGGGC U CCCCAUA		UAUGGGG CUGAUGAG X CGAA ICCCACA	
2511	UGGGCUC C CCAUAUG		CAUAUGG CUGAUGAG X CGAA IAGCCCA	
2512	GGGCUCC C CAUAUGU		ACAUAUG CUGAUGAG X CGAA IGAGCCC	
2513	GGCUCCC C AUAUGUC		GACAUAU CUGAUGAG X CGAA IGGAGCC	

Table 34

2514	GCUCCCC A UAUGUCU		AGACAUA CUGAUGAG X CGAA IGGGAGC	
2521	AUAUGUC U CCCGCCU		AGGCGGG CUGAUGAG X CGAA IACAUAU	
2523	AUGUCUC C CGCCUUC		GAAGGCG CUGAUGAG X CGAA IAGACAU	
2524	UGUCUCC C GCCUUCU		AGAAGGC CUGAUGAG X CGAA IGAGACA	
2527	CUCCCGC C UUCUGGG		CCCAGAA CUGAUGAG X CGAA ICGGGAG	
2528	UCCCGCC U UCUGGGC		GCCCAGA CUGAUGAG X CGAA IGCGGGA	
2531	CGCCUUC U GGGCAUC		GAUGCCC CUGAUGAG X CGAA IAAGGCG	
2536	UCUGGGC A UCUGCCU		AGGCAGA CUGAUGAG X CGAA ICCCAGA	
2539	GGGCAUC U GCCUGAC		GUCAGGC CUGAUGAG X CGAA IAUGCCC	
2542	CAUCUGC C UGACAUC		GAUGUCA CUGAUGAG X CGAA ICAGAUG	
2543	AUCUGCC U GACAUCC		GGAUGUC CUGAUGAG X CGAA IGCAGAU	
2547	GCCUGAC A UCCACGG		CCGUGGA CUGAUGAG X CGAA IUCAGGC	
2550	UGACAUC C ACGGUGC		GCACCGU CUGAUGAG X CGAA IAUGUCA	
2551	GACAUCC A CGGUGCA		UGCACCG CUGAUGAG X CGAA IGAUGUC	
2558	ACGGUGC A GCUGGUG		CACCAGC CUGAUGAG X CGAA ICACCGU	
2561	GUGCAGC U GGUGACA		UGUCACC CUGAUGAG X CGAA ICUGCAC	
2568	UGGUGAC A CAGCUUA		UAAGCUG CUGAUGAG X CGAA IUCACCA	
2570	GUGACAC A GCUUAUG		CAUAAGC CUGAUGAG X CGAA IUGUCAC	
2573	ACACAGC U UAUGCCC		GGGCAUA CUGAUGAG X CGAA ICUGUGU	
2579	CUUAUGC C CUAUGGC		GCCAUAG CUGAUGAG X CGAA ICAUAAG	
2580	UUAUGCC C UAUGGCU		AGCCAUA CUGAUGAG X CGAA IGCAUAA	
2581	UAUGCCC U AUGGCUG		CAGCCAU CUGAUGAG X CGAA IGGCAUA	
2587	CUAUGGC U GCCUCUU		AAGAGGC CUGAUGAG X CGAA ICCAUAG	
2590	UGGCUGC C UCUUAGA		UCUAAGA CUGAUGAG X CGAA ICAGCCA	
2591	GGCUGCC U CUUAGAC		GUCUAAG CUGAUGAG X CGAA IGCAGCC	
2593	CUGCCUC U UAGACCA		UGGUCUA CUGAUGAG X CGAA IAGGCAG	
2599	CUUAGAC C AUGUCCG		CGGACAU CUGAUGAG X CGAA IUCUAAG	
2600	UUAGACC A UGUCCGG		CCGGACA CUGAUGAG X CGAA IGUCUAA	
2605	CCAUGUC C GGGAAAA		UUUUCCC CUGAUGAG X CGAA IACAUGG	
2614	GGAAAAC C GCGGACG		CGUCCGC CUGAUGAG X CGAA IUUUUCC	
2623	CGGACGC C UGGGCUC		GAGCCCA CUGAUGAG X CGAA ICGUCCG	
2624	GGACGCC U GGGCUCC		GGAGCCC CUGAUGAG X CGAA IGCGUCC	
2629	CCUGGGC U CCCAGGA		UCCUGGG CUGAUGAG X CGAA ICCCAGG	
2631	UGGGCUC C CAGGACC		GGUCCUG CUGAUGAG X CGAA IAGCCCA	
2632	GGGCUCC C AGGACCU		AGGUCCU CUGAUGAG X CGAA IGAGCCC	
2633	GGCUCCC A GGACCUG		CAGGUCC CUGAUGAG X CGAA IGGAGCC	
2638	CCAGGAC C UGCUGAA		UUCAGCA CUGAUGAG X CGAA IUCCUGG	
2639	CAGGACC U GCUGAAC		GUUCAGC CUGAUGAG X CGAA IGUCCUG	
2642	GACCUGC U GAACUGG		CCAGUUC CUGAUGAG X CGAA ICAGGUC	
2647	GCUGAAC U GGUGUAU		AUACACC CUGAUGAG X CGAA IUUCAGC	
2657	UGUAUGC A GAUUGCC		GGCAAUC CUGAUGAG X CGAA ICAUACA	
2664	AGAUUGC C AAGGGGA		UCCCCUU CUGAUGAG X CGAA ICAAUCU	
2665	GAUUGCC A AGGGGAU		AUCCCCU CUGAUGAG X CGAA IGCAAUC	
2677	GAUGAGC U ACCUGGA		UCCAGGU CUGAUGAG X CGAA ICUCAUC	
2680	GAGCUAC C UGGAGGA		UCCUCCA CUGAUGAG X CGAA IUAGCUC	
2681	AGCUACC U GGAGGAU		AUCCUCC CUGAUGAG X CGAA IGUAGCU	
2696	GUGCGGC U CGUACAC		GUGUACG CUGAUGAG X CGAA ICCGCAC	

Table 34

2702	CUCGUAC A CAGGGAC		GUCCCUG CUGAUGAG X CGAA IUACGAG	
2704	CGUACAC A GGGACUU		AAGUCCC CUGAUGAG X CGAA IUGUACG	
2710	CAGGGAC U UGGCCGC		GCGGCCA CUGAUGAG X CGAA IUCCCUG	
2715	ACUUGGC C GCUCGGA		UCCGAGC CUGAUGAG X CGAA ICCAAGU	
2718	UGGCCGC U CGGAACG		CGUUCCG CUGAUGAG X CGAA ICGGCCA	
2729	AACGUGC U GGUCAAG		CUUGACC CUGAUGAG X CGAA ICACGUU	
2734	GCUGGUC A AGAGUCC		GGACUCU CUGAUGAG X CGAA IACCAGC	
2741	AAGAGUC C CAACCAU		AUGGUUG CUGAUGAG X CGAA IACUCUU	
2742	AGAGUCC C AACCAUG		CAUGGUU CUGAUGAG X CGAA IGACUCU	
2743	GAGUCCC A ACCAUGU		ACAUGGU CUGAUGAG X CGAA IGGACUC	
2746	UCCCAAC C AUGUCAA		UUGACAU CUGAUGAG X CGAA IUUGGGA	
2747	CCCAACC A UGUCAAA		UUUGACA CUGAUGAG X CGAA IGUUGGG	
2752	CCAUGUC A AAAUUAC		GUAAUUU CUGAUGAG X CGAA IACAUGG	
2760	AAAUUAC A GACUUCG		CGAAGUC CUGAUGAG X CGAA IUAAUUU	
2764	UACAGAC U UCGGGCU		AGCCCGA CUGAUGAG X CGAA IUCUGUA	
2771	UUCGGGC U GGCUCGG		CCGAGCC CUGAUGAG X CGAA ICCCGAA	
2775	GGCUGGC U CGGCUGC		GCAGCCG CUGAUGAG X CGAA ICCAGCC	
2780	GCUCGGC U GCUGGAC		GUCCAGC CUGAUGAG X CGAA ICCGAGC	
2783	CGGCUGC U GGACAUU		AAUGUCC CUGAUGAG X CGAA ICAGCCG	
2788	GCUGGAC A UUGACGA		UCGUCAA CUGAUGAG X CGAA IUCCAGC	
2799	ACGAGAC A GAGUACC		GGUACUC CUGAUGAG X CGAA IUCUCGU	
2806	AGAGUAC C AUGCAGA		UCUGCAU CUGAUGAG X CGAA IUACUCU	
2807	GAGUACC A UGCAGAU		AUCUGCA CUGAUGAG X CGAA IGUACUC	
2811	ACCAUGC A GAUGGGG		CCCCAUC CUGAUGAG X CGAA ICAUGGU	
2821	UGGGGGC A AGGUGCC		GGCACCU CUGAUGAG X CGAA ICCCCCA	
2828	AAGGUGC C CAUCAAG		CUUGAUG CUGAUGAG X CGAA ICACCUU	
2829	AGGUGCC C AUCAAGU		ACUUGAU CUGAUGAG X CGAA IGCACCU	
2830	GGUGCCC A UCAAGUG		CACUUGA CUGAUGAG X CGAA IGGCACC	
2833	GCCCAUC A AGUGGAU		AUCCACU CUGAUGAG X CGAA IAUGGGC	
2846	AUGGCGC U GGAGUCC		GGACUCC CUGAUGAG X CGAA ICGCCAU	
2853	UGGAGUC C AUUCUCC		GGAGAAU CUGAUGAG X CGAA IACUCCA	
2854	GGAGUCC A UUCUCCG		CGGAGAA CUGAUGAG X CGAA IGACUCC	
2858	UCCAUUC U CCGCCGG		CCGGCGG CUGAUGAG X CGAA IAAUGGA	
2860	CAUUCUC C GCCGGCG		CGCCGGC CUGAUGAG X CGAA IAGAAUG	
2863	UCUCCGC C GGCGGUU		AACCGCC CUGAUGAG X CGAA ICGGAGA	
2872	GCGGUUC A CCCACCA		UGGUGGG CUGAUGAG X CGAA IAACCGC	
2874	GGUUCAC C CACCAGA		UCUGGUG CUGAUGAG X CGAA IUGAACC	
2875	GUUCACC C ACCAGAG		CUCUGGU CUGAUGAG X CGAA IGUGAAC	
2876	UUCACCC A CCAGAGU		ACUCUGG CUGAUGAG X CGAA IGGUGAA	
2878	CACCCAC C AGAGUGA		UCACUCU CUGAUGAG X CGAA IUGGGUG	
2879	ACCCACC A GAGUGAU		AUCACUC CUGAUGAG X CGAA IGUGGGU	
2907	GUGUGAC U GUGUGGG		CCCACAC CUGAUGAG X CGAA IUCACAC	
2918	UGGGAGC U GAUGACU		AGUCAUC CUGAUGAG X CGAA ICUCCCA	
2925	UGAUGAC U UUUGGGG		CCCCAAA CUGAUGAG X CGAA IUCAUCA	
2934	UUGGGGC C AAACCUU		AAGGUUU CUGAUGAG X CGAA ICCCCAA	
2935	UGGGGCC A AACCUUA		UAAGGUU CUGAUGAG X CGAA IGCCCCA	
2939	GCCAAAC C UUACGAU		AUCGUAA CUGAUGAG X CGAA IUUUGGC	

Table 34

2940	CCAAACC U UACGAUG		CAUCGUA CUGAUGAG X CGAA IGUUUGG	
2953	UGGGAUC C CAGCCCG		CGGGCUG CUGAUGAG X CGAA IAUCCCA	
2954	GGGAUCC C AGCCCGG		CCGGGCU CUGAUGAG X CGAA IGAUCCC	
2955	GGAUCCC A GCCCGGG		CCCGGGC CUGAUGAG X CGAA IGGAUCC	
2958	UCCCAGC C CGGGAGA		UCUCCCG CUGAUGAG X CGAA ICUGGGA	
2959	CCCAGCC C GGGAGAU		AUCUCCC CUGAUGAG X CGAA IGCUGGG	
2968	GGAGAUC C CUGACCU		AGGUCAG CUGAUGAG X CGAA IAUCUCC	
2969	GAGAUCC C UGACCUG		CAGGUCA CUGAUGAG X CGAA IGAUCUC	
2970	AGAUCCC U GACCUGC		GCAGGUC CUGAUGAG X CGAA IGGAUCU	
2974	CCCUGAC C UGCUGGA		UCCAGCA CUGAUGAG X CGAA IUCAGGG	
2975	CCUGACC U GCUGGAA		UUCCAGC CUGAUGAG X CGAA IGUCAGG	
2978	GACCUGC U GGAAAAG		CUUUUCC CUGAUGAG X CGAA ICAGGUC	
2996	GAGCGGC U GCCCCAG		CUGGGGC CUGAUGAG X CGAA ICCGCUC	
2999	CGGCUGC C CCAGCCC		GGGCUGG CUGAUGAG X CGAA ICAGCCG	
3000	GGCUGCC C CAGCCCC		GGGGCUG CUGAUGAG X CGAA IGCAGCC	
3001	GCUGCCC C AGCCCCC		GGGGGCU CUGAUGAG X CGAA IGGCAGC	
3002	CUGCCCC A GCCCCCC		GGGGGGC CUGAUGAG X CGAA IGGGCAG	
3005	CCCCAGC C CCCCAUC		GAUGGGG CUGAUGAG X CGAA ICUGGGG	
3006	CCCAGCC C CCCAUCU		AGAUGGG CUGAUGAG X CGAA IGCUGGG	
3007	CCAGCCC C CCAUCUG		CAGAUGG CUGAUGAG X CGAA IGGCUGG	
3008	CAGCCCC C CAUCUGC		GCAGAUG CUGAUGAG X CGAA IGGGCUG	
3009	AGCCCCC C AUCUGCA		UGCAGAU CUGAUGAG X CGAA IGGGGCU	
3010	GCCCCCC A UCUGCAC		GUGCAGA CUGAUGAG X CGAA IGGGGGC	
3013	CCCCAUC U GCACCAU		AUGGUGC CUGAUGAG X CGAA IAUGGGG	
3016	CAUCUGC A CCAUUGA		UCAAUGG CUGAUGAG X CGAA ICAGAUG	
3018	UCUGCAC C AUUGAUG		CAUCAAU CUGAUGAG X CGAA IUGCAGA	
3019	CUGCACC A UUGAUGU		ACAUCAA CUGAUGAG X CGAA IGUGCAG	
3028	UGAUGUC U ACAUGAU		AUCAUGU CUGAUGAG X CGAA IACAUCA	
3031	UGUCUAC A UGAUCAU		AUGAUCA CUGAUGAG X CGAA IUAGACA	
3037	CAUGAUC A UGGUCAA		UUGACCA CUGAUGAG X CGAA IAUCAUG	
3043	CAUGGUC A AAUGUUG		CAACAUU CUGAUGAG X CGAA IACCAUG	
3061	GAUUGAC U CUGAAUG		CAUUCAG CUGAUGAG X CGAA IUCAAUC	
3063	UUGACUC U GAAUGUC		GACAUUC CUGAUGAG X CGAA IAGUCAA	
3074	UGUCGGC C AAGAUUC		GAAUCUU CUGAUGAG X CGAA ICCGACA	
3075	GUCGGCC A AGAUUCC		GGAAUCU CUGAUGAG X CGAA IGCCGAC	
3082	AAGAUUC C GGGAGUU		AACUCCC CUGAUGAG X CGAA IAAUCUU	
3096	UGGUGUC U GAAUUCU		AGAAUUC CUGAUGAG X CGAA IACACCA	
3103	UGAAUUC U CCCGCAU		AUGCGGG CUGAUGAG X CGAA IAAUUCA	
3105	AAUUCUC C CGCAUGG		CCAUGCG CUGAUGAG X CGAA IAGAAUU	
3106	AUUCUCC C GCAUGGC		GCCAUGC CUGAUGAG X CGAA IGAGAAU	
3109	CUCCCGC A UGGCCAG		CUGGCCA CUGAUGAG X CGAA ICGGGAG	
3114	GCAUGGC C AGGGACC		GGUCCCU CUGAUGAG X CGAA ICCAUGC	
3115	CAUGGCC A GGGACCC		GGGUCCC CUGAUGAG X CGAA IGCCAUG	
3121	CAGGGAC C CCCAGCG		CGCUGGG CUGAUGAG X CGAA IUCCCUG	
3122	AGGGACC C CCAGCGC		GCGCUGG CUGAUGAG X CGAA IGUCCCU	
3123	GGGACCC C CAGCGCU		AGCGCUG CUGAUGAG X CGAA IGGUCCC	
3124	GGACCCC C AGCGCUU		AAGCGCU CUGAUGAG X CGAA IGGGUCC	

Table 34

3125	GACCCCC A GCGCUUU		AAAGCGC CUGAUGAG X CGAA IGGGGUC	
3130	CCAGCGC U UUGUGGU		ACCACAA CUGAUGAG X CGAA ICGCUGG	
3139	UGUGGUC A UCCAGAA		UUCUGGA CUGAUGAG X CGAA IACCACA	
3142	GGUCAUC C AGAAUGA		UCAUUCU CUGAUGAG X CGAA IAUGACC	
3143	GUCAUCC A GAAUGAG		CUCAUUC CUGAUGAG X CGAA IGAUGAC	
3154	UGAGGAC U UGGGCCC		GGGCCCA CUGAUGAG X CGAA IUCCUCA	
3160	CUUGGGC C CAGCCAG		CUGGCUG CUGAUGAG X CGAA ICCCAAG	
3161	UUGGGCC C AGCCAGU		ACUGGCU CUGAUGAG X CGAA IGCCCAA	
3162	UGGGCCC A GCCAGUC		GACUGGC CUGAUGAG X CGAA IGGCCCA	
3165	GCCCAGC C AGUCCCU		AGGGACU CUGAUGAG X CGAA ICUGGGC	
3166	CCCAGCC A GUCCCUU		AAGGGAC CUGAUGAG X CGAA IGCUGGG	
3170	GCCAGUC C CUUGGAC		GUCCAAG CUGAUGAG X CGAA IACUGGC	
3171	CCAGUCC C UUGGACA		UGUCCAA CUGAUGAG X CGAA IGACUGG	
3172	CAGUCCC U UGGACAG		CUGUCCA CUGAUGAG X CGAA IGGACUG	
3178	CUUGGAC A GCACCUU		AAGGUGC CUGAUGAG X CGAA IUCCAAG	
3181	GGACAGC A CCUUCUA		UAGAAGG CUGAUGAG X CGAA ICUGUCC	
3183	ACAGCAC C UUCUACC		GGUAGAA CUGAUGAG X CGAA IUGCUGU	
3184	CAGCACC U UCUACCG		CGGUAGA CUGAUGAG X CGAA IGUGCUG	
3187	CACCUUC U ACCGCUC		GAGCGGU CUGAUGAG X CGAA IAAGGUG	
3190	CUUCUAC C GCUCACU		AGUGAGC CUGAUGAG X CGAA IUAGAAG	
3193	CUACCGC U CACUGCU		AGCAGUG CUGAUGAG X CGAA ICGGUAG	
3195	ACCGCUC A CUGCUGG		CCAGCAG CUGAUGAG X CGAA IAGCGGU	
3197	CGCUCAC U GCUGGAG		CUCCAGC CUGAUGAG X CGAA IUGAGCG	
3200	UCACUGC U GGAGGAC		GUCCUCC CUGAUGAG X CGAA ICAGUGA	
3214	CGAUGAC A UGGGGGA		UCCCCCA CUGAUGAG X CGAA IUCAUCG	
3223	GGGGGAC C UGGUGGA		UCCACCA CUGAUGAG X CGAA IUCCCCC	
3224	GGGGACC U GGUGGAU		AUCCACC CUGAUGAG X CGAA IGUCCCC	
3234	UGGAUGC U GAGGAGU		ACUCCUC CUGAUGAG X CGAA ICAUCCA	
3245	GAGUAUC U GGUACCC		GGGUACC CUGAUGAG X CGAA IAUACUC	
3251	CUGGUAC C CCAGCAG		CUGCUGG CUGAUGAG X CGAA IUACCAG	
3252	UGGUACC C CAGCAGG		CCUGCUG CUGAUGAG X CGAA IGUACCA	
3253	GGUACCC C AGCAGGG		CCCUGCU CUGAUGAG X CGAA IGGUACC	
3254	GUACCCC A GCAGGGC		GCCCUGC CUGAUGAG X CGAA IGGGUAC	
3257	CCCCAGC A GGGCUUC		GAAGCCC CUGAUGAG X CGAA ICUGGGG	
3262	GCAGGGC U UCUUCUG		CAGAAGA CUGAUGAG X CGAA ICCCUGC	
3265	GGGCUUC U UCUGUCC		GGACAGA CUGAUGAG X CGAA IAAGCCC	
3268	CUUCUUC U GUCCAGA		UCUGGAC CUGAUGAG X CGAA IAAGAAG	
3272	UUCUGUC C AGACCCU		AGGGUCU CUGAUGAG X CGAA IACAGAA	
3273	UCUGUCC A GACCCUG		CAGGGUC CUGAUGAG X CGAA IGACAGA	
3277	UCCAGAC C CUGCCCC		GGGGCAG CUGAUGAG X CGAA IUCUGGA	
3278	CCAGACC C UGCCCCG		CGGGGCA CUGAUGAG X CGAA IGUCUGG	
3279	CAGACCC U GCCCCGG		CCGGGGC CUGAUGAG X CGAA IGGUCUG	
3282	ACCCUGC C CCGGGCG		CGCCCGG CUGAUGAG X CGAA ICAGGGU	
3283	CCCUGCC C CGGGCGC		GCGCCCG CUGAUGAG X CGAA IGCAGGG	
3284	CCUGCCC C GGGCGCU		AGCGCCC CUGAUGAG X CGAA IGGCAGG	
3291	CGGGCGC U GGGGGCA		UGCCCCC CUGAUGAG X CGAA ICGCCCG	
3298	UGGGGGC A UGGUCCA		UGGACCA CUGAUGAG X CGAA ICCCCCA	

Table 34

3304	CAUGGUC C ACCACAG		CUGUGGU CUGAUGAG X CGAA IACCAUG	
3305	AUGGUCC A CCACAGG		CCUGUGG CUGAUGAG X CGAA IGACCAU	
3307	GGUCCAC C ACAGGCA		UGCCUGU CUGAUGAG X CGAA IUGGACC	
3308	GUCCACC A CAGGCAC		GUGCCUG CUGAUGAG X CGAA IGUGGAC	
3310	CCACCAC A GGCACCG		CGGUGCC CUGAUGAG X CGAA IUGGUGG	
3314	CACAGGC A CCGCAGC		GCUGCGG CUGAUGAG X CGAA ICCUGUG	
3316	CAGGCAC C GCAGCUC		GAGCUGC CUGAUGAG X CGAA IUGCCUG	
3319	GCACCGC A GCUCAUC		GAUGAGC CUGAUGAG X CGAA ICGGUGC	
3322	CCGCAGC U CAUCUAC		GUAGAUG CUGAUGAG X CGAA ICUGCGG	
3324	GCAGCUC A UCUACCA		UGGUAGA CUGAUGAG X CGAA IAGCUGC	
3327	GCUCAUC U ACCAGGA		UCCUGGU CUGAUGAG X CGAA IAUGAGC	
3330	CAUCUAC C AGGAGUG		CACUCCU CUGAUGAG X CGAA IUAGAUG	
3331	AUCUACC A GGAGUGG		CCACUCC CUGAUGAG X CGAA IGUAGAU	
3349	UGGGGAC C UGACACU		AGUGUCA CUGAUGAG X CGAA IUCCCCA	
3350	GGGGACC U GACACUA		UAGUGUC CUGAUGAG X CGAA IGUCCCC	
3354	ACCUGAC A CUAGGGC		GCCCUAG CUGAUGAG X CGAA IUCAGGU	
3356	CUGACAC U AGGGCUG		CAGCCCU CUGAUGAG X CGAA IUGUCAG	
3362	CUAGGGC U GGAGCCC		GGGCUCC CUGAUGAG X CGAA ICCCUAG	
3368	CUGGAGC C CUCUGAA		UUCAGAG CUGAUGAG X CGAA ICUCCAG	
3369	UGGAGCC C UCUGAAG		CUUCAGA CUGAUGAG X CGAA IGCUCCA	
3370	GGAGCCC U CUGAAGA		UCUUCAG CUGAUGAG X CGAA IGGCUCC	
3372	AGCCCUC U GAAGAGG		CCUCUUC CUGAUGAG X CGAA IAGGGCU	
3384	AGGAGGC C CCCAGGU		ACCUGGG CUGAUGAG X CGAA ICCUCCU	
3385	GGAGGCC C CCAGGUC		GACCUGG CUGAUGAG X CGAA IGCCUCC	
3386	GAGGCCC C CAGGUCU		AGACCUG CUGAUGAG X CGAA IGGCCUC	
3387	AGGCCCC C AGGUCUC		GAGACCU CUGAUGAG X CGAA IGGGCCU	
3388	GGCCCCC A GGUCUCC		GGAGACC CUGAUGAG X CGAA IGGGGCC	
3393	CCAGGUC U CCACUGG		CCAGUGG CUGAUGAG X CGAA IACCUGG	
3395	AGGUCUC C ACUGGCA		UGCCAGU CUGAUGAG X CGAA IAGACCU	
3396	GGUCUCC A CUGGCAC		GUGCCAG CUGAUGAG X CGAA IGAGACC	
3398	UCUCCAC U GGCACCC		GGGUGCC CUGAUGAG X CGAA IUGGAGA	
3402	CACUGGC A CCCUCCG		CGGAGGG CUGAUGAG X CGAA ICCAGUG	
3404	CUGGCAC C CUCCGAA		UUCGGAG CUGAUGAG X CGAA IUGCCAG	
3405	UGGCACC C UCCGAAG		CUUCGGA CUGAUGAG X CGAA IGUGCCA	
3406	GGCACCC U CCGAAGG		CCUUCGG CUGAUGAG X CGAA IGGUGCC	
3408	CACCCUC C GAAGGGG		CCCCUUC CUGAUGAG X CGAA IAGGGUG	
3417	AAGGGGC U GGCUCCG		CGGAGCC CUGAUGAG X CGAA ICCCCUU	
3421	GGCUGGC U CCGAUGU		ACAUCGG CUGAUGAG X CGAA ICCAGCC	
3423	CUGGCUC C GAUGUAU		AUACAUC CUGAUGAG X CGAA IAGCCAG	
3442	UGGUGAC C UGGGAAU		AUUCCCA CUGAUGAG X CGAA IUCACCA	
3443	GGUGACC U GGGAAUG		CAUUCCC CUGAUGAG X CGAA IGUCACC	
3456	UGGGGGC A GCCAAGG		CCUUGGC CUGAUGAG X CGAA ICCCCCA	
3459	GGGCAGC C AAGGGGC		GCCCCUU CUGAUGAG X CGAA ICUGCCC	
3460	GGCAGCC A AGGGGCU		AGCCCCU CUGAUGAG X CGAA IGCUGCC	
3467	AAGGGGC U GCAAAGC		GCUUUGC CUGAUGAG X CGAA ICCCCUU	
3470	GGGCUGC A AAGCCUC		GAGGCUU CUGAUGAG X CGAA ICAGCCC	
3475	GCAAAGC C UCCCCAC		GUGGGGA CUGAUGAG X CGAA ICUUUGC	

Table 34

3476	CAAAGCC U CCCCACA		UGUGGGG CUGAUGAG X CGAA IGCUUUG	
3478	AAGCCUC C CCACACA		UGUGUGG CUGAUGAG X CGAA IAGGCUU	
3479	AGCCUCC C CACACAU		AUGUGUG CUGAUGAG X CGAA IGAGGCU	
3480	GCCUCCC C ACACAUG		CAUGUGU CUGAUGAG X CGAA IGGAGGC	
3481	CCUCCCC A CACAUGA		UCAUGUG CUGAUGAG X CGAA IGGGAGG	
3483	UCCCCAC A CAUGACC		GGUCAUG CUGAUGAG X CGAA IUGGGGA	
3485	CCCACAC A UGACCCC		GGGGUCA CUGAUGAG X CGAA IUGUGGG	
3490	ACAUGAC C CCAGCCC		GGGCUGG CUGAUGAG X CGAA IUCAUGU	
3491	CAUGACC C CAGCCCU		AGGGCUG CUGAUGAG X CGAA IGUCAUG	
3492	AUGACCC C AGCCCUC		GAGGGCU CUGAUGAG X CGAA IGGUCAU	
3493	UGACCCC A GCCCUCU		AGAGGGC CUGAUGAG X CGAA IGGGUCA	
3496	CCCCAGC C CUCUACA		UGUAGAG CUGAUGAG X CGAA ICUGGGG	
3497	CCCAGCC C UCUACAG		CUGUAGA CUGAUGAG X CGAA IGCUGGG	
3498	CCAGCCC U CUACAGC		GCUGUAG CUGAUGAG X CGAA IGGCUGG	
3500	AGCCCUC U ACAGCGG		CCGCUGU CUGAUGAG X CGAA IAGGGCU	
3503	CCUCUAC A GCGGUAC		GUACCGC CUGAUGAG X CGAA IUAGAGG	
3511	GCGGUAC A GUGAGGA		UCCUCAC CUGAUGAG X CGAA IUACCGC	
3520	UGAGGAC C CCACAGU		ACUGUGG CUGAUGAG X CGAA IUCCUCA	
3521	GAGGACC C CACAGUA		UACUGUG CUGAUGAG X CGAA IGUCCUC	
3522	AGGACCC C ACAGUAC		GUACUGU CUGAUGAG X CGAA IGGUCCU	
3523	GGACCCC A CAGUACC		GGUACUG CUGAUGAG X CGAA IGGGUCC	
3525	ACCCCAC A GUACCCC		GGGGUAC CUGAUGAG X CGAA IUGGGGU	
3530	ACAGUAC C CCUGCCC		GGGCAGG CUGAUGAG X CGAA IUACUGU	
3531	CAGUACC C CUGCCCU		AGGGCAG CUGAUGAG X CGAA IGUACUG	
3532	AGUACCC C UGCCCUC		GAGGGCA CUGAUGAG X CGAA IGGUACU	
3533	GUACCCC U GCCCUCU		AGAGGGC CUGAUGAG X CGAA IGGGUAC	
3536	CCCCUGC C CUCUGAG		CUCAGAG CUGAUGAG X CGAA ICAGGGG	
3537	CCCUGCC C UCUGAGA		UCUCAGA CUGAUGAG X CGAA IGCAGGG	
3538	CCUGCCC U CUGAGAC		GUCUCAG CUGAUGAG X CGAA IGGCAGG	
3540	UGCCCUC U GAGACUG		CAGUCUC CUGAUGAG X CGAA IAGGGCA	
3546	CUGAGAC U GAUGGCU		AGCCAUC CUGAUGAG X CGAA IUCUCAG	
3553	UGAUGGC U ACGUUGC		GCAACGU CUGAUGAG X CGAA ICCAUCA	
3561	ACGUUGC C CCCCUGA		UCAGGGG CUGAUGAG X CGAA ICAACGU	
3562	CGUUGCC C CCCUGAC		GUCAGGG CUGAUGAG X CGAA IGCAACG	
3563	GUUGCCC C CCUGACC		GGUCAGG CUGAUGAG X CGAA IGGCAAC	
3564	UUGCCCC C CUGACCU		AGGUCAG CUGAUGAG X CGAA IGGGCAA	
3565	UGCCCCC C UGACCUG		CAGGUCA CUGAUGAG X CGAA IGGGGCA	
3566	GCCCCCC U GACCUGC		GCAGGUC CUGAUGAG X CGAA IGGGGGC	
3570	CCCUGAC C UGCAGCC		GGCUGCA CUGAUGAG X CGAA IUCAGGG	
3571	CCUGACC U GCAGCCC		GGGCUGC CUGAUGAG X CGAA IGUCAGG	
3574	GACCUGC A GCCCCCA		UGGGGGC CUGAUGAG X CGAA ICAGGUC	
3577	CUGCAGC C CCCAGCC		GGCUGGG CUGAUGAG X CGAA ICUGCAG	
3578	UGCAGCC C CCAGCCU		AGGCUGG CUGAUGAG X CGAA IGCUGCA	
3579	GCAGCCC C CAGCCUG		CAGGCUG CUGAUGAG X CGAA IGGCUGC	
3580	CAGCCCC C AGCCUGA		UCAGGCU CUGAUGAG X CGAA IGGGCUG	
3581	AGCCCCC A GCCUGAA		UUCAGGC CUGAUGAG X CGAA IGGGGCU	
3584	CCCCAGC C UGAAUAU		AUAUUCA CUGAUGAG X CGAA ICUGGGG	

Table 34

3585	CCCAGCC U GAAUAUG		CAUAUUC CUGAUGAG X CGAA IGCUGGG	
3598	UGUGAAC C AGCCAGA		UCUGGCU CUGAUGAG X CGAA IUUCACA	
3599	GUGAACC A GCCAGAU		AUCUGGC CUGAUGAG X CGAA IGUUCAC	
3602	AACCAGC C AGAUGUU		AACAUCU CUGAUGAG X CGAA ICUGGUU	
3603	ACCAGCC A GAUGUUC		GAACAUC CUGAUGAG X CGAA IGCUGGU	
3614	GUUCGGC C CCAGCCC		GGGCUGG CUGAUGAG X CGAA ICCGAAC	
3615	UUCGGCC C CAGCCCC		GGGGCUG CUGAUGAG X CGAA IGCCGAA	
3616	UCGGCCC C AGCCCCC		GGGGGCU CUGAUGAG X CGAA IGGCCGA	
3617	CGGCCCC A GCCCCCU		AGGGGGC CUGAUGAG X CGAA IGGGCCG	
3620	CCCCAGC C CCCUUCG		CGAAGGG CUGAUGAG X CGAA ICUGGGG	
3621	CCCAGCC C CCUUCGC		GCGAAGG CUGAUGAG X CGAA IGCUGGG	
3622	CCAGCCC C CUUCGCC		GGCGAAG CUGAUGAG X CGAA IGGCUGG	
3623	CAGCCCC C UUCGCCC		GGGCGAA CUGAUGAG X CGAA IGGGCUG	
3624	AGCCCCC U UCGCCCC		GGGGCGA CUGAUGAG X CGAA IGGGGCU	
3629	CCUUCGC C CCGAGAG		CUCUCGG CUGAUGAG X CGAA ICGAAGG	
3630	CUUCGCC C CGAGAGG		CCUCUCG CUGAUGAG X CGAA IGCGAAG	
3631	UUCGCCC C GAGAGGG		CCCUCUC CUGAUGAG X CGAA IGGCGAA	
3640	AGAGGGC C CUCUGCC		GGCAGAG CUGAUGAG X CGAA ICCCUCU	
3641	GAGGGCC C UCUGCCU		AGGCAGA CUGAUGAG X CGAA IGCCCUC	
3642	AGGGCCC U CUGCCUG		CAGGCAG CUGAUGAG X CGAA IGGCCCU	
3644	GGCCCUC U GCCUGCU		AGCAGGC CUGAUGAG X CGAA IAGGGCC	
3647	CCUCUGC C UGCUGCC		GGCAGCA CUGAUGAG X CGAA ICAGAGG	
3648	CUCUGCC U GCUGCCC		GGGCAGC CUGAUGAG X CGAA IGCAGAG	
3651	UGCCUGC U GCCCGAC		GUCGGGC CUGAUGAG X CGAA ICAGGCA	
3654	CUGCUGC C CGACCUG		CAGGUCG CUGAUGAG X CGAA ICAGCAG	
3655	UGCUGCC C GACCUGC		GCAGGUC CUGAUGAG X CGAA IGCAGCA	
3659	GCCCGAC C UGCUGGU		ACCAGCA CUGAUGAG X CGAA IUCGGGC	
3660	CCCGACC U GCUGGUG		CACCAGC CUGAUGAG X CGAA IGUCGGG	
3663	GACCUGC U GGUGCCA		UGGCACC CUGAUGAG X CGAA ICAGGUC	
3669	CUGGUGC C ACUCUGG		CCAGAGU CUGAUGAG X CGAA ICACCAG	
3670	UGGUGCC A CUCUGGA		UCCAGAG CUGAUGAG X CGAA IGCACCA	
3672	GUGCCAC U CUGGAAA		UUUCCAG CUGAUGAG X CGAA IUGGCAC	
3674	GCCACUC U GGAAAGG		CCUUUCC CUGAUGAG X CGAA IAGUGGC	
3683	GAAAGGC C CAAGACU		AGUCUUG CUGAUGAG X CGAA ICCUUUC	
3684	AAAGGCC C AAGACUC		GAGUCUU CUGAUGAG X CGAA IGCCUUU	
3685	AAGGCCC A AGACUCU		AGAGUCU CUGAUGAG X CGAA IGGCCUU	
3690	CCAAGAC U CUCUCCC		GGGAGAG CUGAUGAG X CGAA IUCUUGG	
3692	AAGACUC U CUCCCCA		UGGGGAG CUGAUGAG X CGAA IAGUCUU	
3694	GACUCUC U CCCCAGG		CCUGGGG CUGAUGAG X CGAA IAGAGUC	
3696	CUCUCUC C CCAGGGA		UCCCUGG CUGAUGAG X CGAA IAGAGAG	
3697	UCUCUCC C CAGGGAA		UUCCCUG CUGAUGAG X CGAA IGAGAGA	
3698	CUCUCCC C AGGGAAG		CUUCCCU CUGAUGAG X CGAA IGGAGAG	
3699	UCUCCCC A GGGAAGA		UCUUCCC CUGAUGAG X CGAA IGGGGAGA	
3718	GGUCGUC A AAGACGU		ACGUCUU CUGAUGAG X CGAA IACGACC	
3732	UUUUUGC C UUUGGGG		CCCCAAA CUGAUGAG X CGAA ICAAAAA	
3733	UUUUGCC U UUGGGGG		CCCCCAA CUGAUGAG X CGAA IGCAAAA	
3744	GGGGUGC C GUGGAGA		UCUCCAC CUGAUGAG X CGAA ICACCCC	

Table 34

3754	GGAGAAC C CCGAGUA		UACUCGG CUGAUGAG X CGAA IUUCUCC	
3755	GAGAACC C CGAGUAC		GUACUCG CUGAUGAG X CGAA IGUUCUC	
3756	AGAACCC C GAGUACU		AGUACUC CUGAUGAG X CGAA IGGUUCU	
3763	CGAGUAC U UGACACC		GGUGUCA CUGAUGAG X CGAA IUACUCG	
3768	ACUUGAC A CCCCAGG		CCUGGGG CUGAUGAG X CGAA IUCAAGU	
3770	UUGACAC C CCAGGGA		UCCCUGG CUGAUGAG X CGAA IUGUCAA	
3771	UGACACC C CAGGGAG		CUCCCUG CUGAUGAG X CGAA IGUGUCA	
3772	GACACCC C AGGGAGG		CCUCCCU CUGAUGAG X CGAA IGGUGUC	
3773	ACACCCC A GGGAGGA		UCCUCCC CUGAUGAG X CGAA IGGGUGU	
3783	GAGGAGC U GCCCCUC		GAGGGGC CUGAUGAG X CGAA ICUCCUC	
3786	GAGCUGC C CCUCAGC		GCUGAGG CUGAUGAG X CGAA ICAGCUC	
3787	AGCUGCC C CUCAGCC		GGCUGAG CUGAUGAG X CGAA IGCAGCU	
3788	GCUGCCC C UCAGCCC		GGGCUGA CUGAUGAG X CGAA IGGCAGC	
3789	CUGCCCC U CAGCCCC		GGGGCUG CUGAUGAG X CGAA IGGGCAG	
3791	GCCCCUC A GCCCCAC		GUGGGGC CUGAUGAG X CGAA IAGGGGC	
3794	CCUCAGC C CCACCCU		AGGGUGG CUGAUGAG X CGAA ICUGAGG	
3795	CUCAGCC C CACCCUC		GAGGGUG CUGAUGAG X CGAA IGCUGAG	
3796	UCAGCCC C ACCCUCC		GGAGGGU CUGAUGAG X CGAA IGGCUGA	
3797	CAGCCCC A CCCUCCU		AGGAGGG CUGAUGAG X CGAA IGGGCUG	
3799	GCCCCAC C CUCCUCC		GGAGGAG CUGAUGAG X CGAA IUGGGGC	
3800	CCCCACC C UCCUCCU		AGGAGGA CUGAUGAG X CGAA IGUGGGG	
3801	CCCACCC U CCUCCUG		CAGGAGG CUGAUGAG X CGAA IGGUGGG	
3803	CACCCUC C UCCUGCC		GGCAGGA CUGAUGAG X CGAA IAGGGUG	
3804	ACCCUCC U CCUGCCU		AGGCAGG CUGAUGAG X CGAA IGAGGGU	
3806	CCUCCUC C UGCCUUC		GAAGGCA CUGAUGAG X CGAA IAGGAGG	
3807	CUCCUCC U GCCUUCA		UGAAGGC CUGAUGAG X CGAA IGAGGAG	
3810	CUCCUGC C UUCAGCC		GGCUGAA CUGAUGAG X CGAA ICAGGAG	
3811	UCCUGCC U UCAGCCC		GGGCUGA CUGAUGAG X CGAA IGCAGGA	
3814	UGCCUUC A GCCCAGC		GCUGGGC CUGAUGAG X CGAA IAAGGCA	
3817	CUUCAGC C CAGCCUU		AAGGCUG CUGAUGAG X CGAA ICUGAAG	
3818	UUCAGCC C AGCCUUC		GAAGGCU CUGAUGAG X CGAA IGCUGAA	
3819	UCAGCCC A GCCUUCG		CGAAGGC CUGAUGAG X CGAA IGGCUGA	
3822	GCCCAGC C UUCGACA		UGUCGAA CUGAUGAG X CGAA ICUGGGC	
3823	CCCAGCC U UCGACAA		UUGUCGA CUGAUGAG X CGAA IGCUGGG	
3829	CUUCGAC A ACCUCUA		UAGAGGU CUGAUGAG X CGAA IUCGAAG	
3832	CGACAAC C UCUAUUA		UAAUAGA CUGAUGAG X CGAA IUUGUCG	
3833	GACAACC U CUAUUAC		GUAAUAG CUGAUGAG X CGAA IGUUGUC	
3835	CAACCUC U AUUACUG		CAGUAAU CUGAUGAG X CGAA IAGGUUG	
3841	CUAUUAC U GGGACCA		UGGUCCC CUGAUGAG X CGAA IUAAUAG	
3847	CUGGGAC C AGGACCC		GGGUCCU CUGAUGAG X CGAA IUCCCAG	
3848	UGGGACC A GGACCCA		UGGGUCC CUGAUGAG X CGAA IGUCCCA	
3853	CCAGGAC C CACCAGA		UCUGGUG CUGAUGAG X CGAA IUCCUGG	
3854	CAGGACC C ACCAGAG		CUCUGGU CUGAUGAG X CGAA IGUCCUG	
3855	AGGACCC A CCAGAGC		GCUCUGG CUGAUGAG X CGAA IGGUCCU	
3857	GACCCAC C AGAGCGG		CCGCUCU CUGAUGAG X CGAA IUGGGUC	
3858	ACCCACC A GAGCGGG		CCCGCUC CUGAUGAG X CGAA IGUGGGU	
3870	GGGGGGC U CCACCCA		UGGGUGG CUGAUGAG X CGAA ICCCCCC	

Table 34

3872	GGGGCUC C ACCCAGC		GCUGGGU CUGAUGAG X CGAA IAGCCCC	
3873	GGGCUCC A CCCAGCA		UGCUGGG CUGAUGAG X CGAA IGAGCCC	
3875	GCUCCAC C CAGCACC		GGUGCUG CUGAUGAG X CGAA IUGGAGC	
3876	CUCCACC C AGCACCU		AGGUGCU CUGAUGAG X CGAA IGUGGAG	
3877	UCCACCC A GCACCUU		AAGGUGC CUGAUGAG X CGAA IGGUGGA	
3880	ACCCAGC A CCUUCAA		UUGAAGG CUGAUGAG X CGAA ICUGGGU	
3882	CCAGCAC C UUCAAAG		CUUUGAA CUGAUGAG X CGAA IUGCUGG	
3883	CAGCACC U UCAAAGG		CCUUUGA CUGAUGAG X CGAA IGUGCUG	
3886	CACCUUC A AAGGGAC		GUCCCUU CUGAUGAG X CGAA IAAGGUG	
3894	AAGGGAC A CCUACGG		CCGUAGG CUGAUGAG X CGAA IUCCCUU	
3896	GGGACAC C UACGGCA		UGCCGUA CUGAUGAG X CGAA IUGUCCC	
3897	GGACACC U ACGGCAG		CUGCCGU CUGAUGAG X CGAA IGUGUCC	
3903	CUACGGC A GAGAACC		GGUUCUC CUGAUGAG X CGAA ICCGUAG	
3910	AGAGAAC C CAGAGUA		UACUCUG CUGAUGAG X CGAA IUUCUCU	
3911	GAGAACC C AGAGUAC		GUACUCU CUGAUGAG X CGAA IGUUCUC	
3912	AGAACCC A GAGUACC		GGUACUC CUGAUGAG X CGAA IGGUUCU	
3919	AGAGUAC C UGGGUCU		AGACCCA CUGAUGAG X CGAA IUACUCU	
3920	GAGUACC U GGGUCUG		CAGACCC CUGAUGAG X CGAA IGUACUC	
3926	CUGGGUC U GGACGUG		CACGUCC CUGAUGAG X CGAA IACCCAG	
3935	GACGUGC C AGUGUGA		UCACACU CUGAUGAG X CGAA ICACGUC	
3936	ACGUGCC A GUGUGAA		UUCACAC CUGAUGAG X CGAA IGCACGU	
3945	UGUGAAC C AGAAGGC		GCCUUCU CUGAUGAG X CGAA IUUCACA	
3946	GUGAACC A GAAGGCC		GGCCUUC CUGAUGAG X CGAA IGUUCAC	
3953	AGAAGGC C AAGUCCG		CGGACUU CUGAUGAG X CGAA ICCUUCU	
3954	GAAGGCC A AGUCCGC		GCGGACU CUGAUGAG X CGAA IGCCUUC	
3959	CCAAGUC C GCAGAAG		CUUCUGC CUGAUGAG X CGAA IACUUGG	
3962	AGUCCGC A GAAGCCC		GGGCUUC CUGAUGAG X CGAA ICGGACU	
3968	CAGAAGC C CUGAUGU		ACAUCAG CUGAUGAG X CGAA ICUUCUG	
3969	AGAAGCC C UGAUGUG		CACAUCA CUGAUGAG X CGAA IGCUUCU	
3970	GAAGCCC U GAUGUGU		ACACAUC CUGAUGAG X CGAA IGGCUUC	
3979	AUGUGUC C UCAGGGA		UCCCUGA CUGAUGAG X CGAA IACACAU	
3980	UGUGUCC U CAGGGAG		CUCCCUG CUGAUGAG X CGAA IGACACA	
3982	UGUCCUC A GGGAGCA		UGCUCCC CUGAUGAG X CGAA IAGGACA	
3989	AGGGAGC A GGGAAGG		CCUUCCC CUGAUGAG X CGAA ICUCCCU	
3998	GGAAGGC C UGACUUC		GAAGUCA CUGAUGAG X CGAA ICCUUCC	
3999	GAAGGCC U GACUUCU		AGAAGUC CUGAUGAG X CGAA IGCCUUC	
4003	GCCUGAC U UCUGCUG		CAGCAGA CUGAUGAG X CGAA IUCAGGC	
4006	UGACUUC U GCUGGCA		UGCCAGC CUGAUGAG X CGAA IAAGUCA	
4009	CUUCUGC U GGCAUCA		UGAUGCC CUGAUGAG X CGAA ICAGAAG	
4013	UGCUGGC A UCAAGAG		CUCUUGA CUGAUGAG X CGAA ICCAGCA	
4016	UGGCAUC A AGAGGUG		CACCUCU CUGAUGAG X CGAA IAUGCCA	
4031	GGAGGGC C CUCCGAC		GUCGGAG CUGAUGAG X CGAA ICCCUCC	
4032	GAGGGCC C UCCGACC		GGUCGGA CUGAUGAG X CGAA IGCCCUC	
4033	AGGGCCC U CCGACCA		UGGUCGG CUGAUGAG X CGAA IGGCCCU	
4035	GGCCCUC C GACCACU		AGUGGUC CUGAUGAG X CGAA IAGGGCC	
4039	CUCCGAC C ACUUCCA		UGGAAGU CUGAUGAG X CGAA IUCGGAG	
4040	UCCGACC A CUUCCAG		CUGGAAG CUGAUGAG X CGAA IGUCGGA	

Table 34

4042	CGACCAC U UCCAGGG		CCCUGGA CUGAUGAG X CGAA IUGGUCG	
4045	CCACUUC C AGGGGAA		UUCCCCU CUGAUGAG X CGAA IAAGUGG	
4046	CACUUCC A GGGGAAC		GUUCCCC CUGAUGAG X CGAA IGAAGUG	
4054	GGGGAAC C UGCCAUG		CAUGGCA CUGAUGAG X CGAA IUUCCCC	
4055	GGGAACC U GCCAUGC		GCAUGGC CUGAUGAG X CGAA IGUUCCC	
4058	AACCUGC C AUGCCAG		CUGGCAU CUGAUGAG X CGAA ICAGGUU	
4059	ACCUGCC A UGCCAGG		CCUGGCA CUGAUGAG X CGAA IGCAGGU	
4063	GCCAUGC C AGGAACC		GGUUCCU CUGAUGAG X CGAA ICAUGGC	
4064	CCAUGCC A GGAACCU		AGGUUCC CUGAUGAG X CGAA IGCAUGG	
4070	CAGGAAC C UGUCCUA		UAGGACA CUGAUGAG X CGAA IUUCCUG	
4071	AGGAACC U GUCCUAA		UUAGGAC CUGAUGAG X CGAA IGUUCCU	
4075	ACCUGUC C UAAGGAA		UUCCUUA CUGAUGAG X CGAA IACAGGU	
4076	CCUGUCC U AAGGAAC		GUUCCUU CUGAUGAG X CGAA IGACAGG	
4084	AAGGAAC C UUCCUUC		GAAGGAA CUGAUGAG X CGAA IUUCCUU	
4085	AGGAACC U UCCUUCC		GGAAGGA CUGAUGAG X CGAA IGUUCCU	
4088	AACCUUC C UUCCUGC		GCAGGAA CUGAUGAG X CGAA IAAGGUU	
4089	ACCUUCC U UCCUGCU		AGCAGGA CUGAUGAG X CGAA IGAAGGU	
4092	UUCCUUC C UGCUUGA		UCAAGCA CUGAUGAG X CGAA IAAGGAA	
4093	UCCUUCC U GCUUGAG		CUCAAGC CUGAUGAG X CGAA IGAAGGA	
4096	UUCCUGC U UGAGUUC		GAACUCA CUGAUGAG X CGAA ICAGGAA	
4104	UGAGUUC C CAGAUGG		CCAUCUG CUGAUGAG X CGAA IAACUCA	
4105	GAGUUCC C AGAUGGC		GCCAUCU CUGAUGAG X CGAA IGAACUC	
4106	AGUUCCC A GAUGGCU		AGCCAUC CUGAUGAG X CGAA IGGAACU	
4113	AGAUGGC U GGAAGGG		CCCUUCC CUGAUGAG X CGAA ICCAUCU	
4124	AGGGGUC C AGCCUCG		CGAGGCU CUGAUGAG X CGAA IACCCCU	
4125	GGGGUCC A GCCUCGU		ACGAGGC CUGAUGAG X CGAA IGACCCC	
4128	GUCCAGC C UCGUUGG		CCAACGA CUGAUGAG X CGAA ICUGGAC	
4129	UCCAGCC U CGUUGGA		UCCAACG CUGAUGAG X CGAA IGCUGGA	
4145	GAGGAAC A GCACUGG		CCAGUGC CUGAUGAG X CGAA IUUCCUC	
4148	GAACAGC A CUGGGGA		UCCCCAG CUGAUGAG X CGAA ICUGUUC	
4150	ACAGCAC U GGGGAGU		ACUCCCC CUGAUGAG X CGAA IUGCUGU	
4159	GGGAGUC U UUGUGGA		UCCACAA CUGAUGAG X CGAA IACUCCC	
4170	UGGAUUC U GAGGCCC		GGGCCUC CUGAUGAG X CGAA IAAUCCA	
4176	CUGAGGC C CUGCCCA		UGGGCAG CUGAUGAG X CGAA ICCUCAG	
4177	UGAGGCC C UGCCCAA		UUGGGCA CUGAUGAG X CGAA IGCCUCA	
4178	GAGGCCC U GCCCAAU		AUUGGGC CUGAUGAG X CGAA IGGCCUC	
4181	GCCCUGC C CAAUGAG		CUCAUUG CUGAUGAG X CGAA ICAGGGC	
4182	CCCUGCC C AAUGAGA		UCUCAUU CUGAUGAG X CGAA IGCAGGG	
4183	CCUGCCC A AUGAGAC		GUCUCAU CUGAUGAG X CGAA IGGCAGG	
4191	AUGAGAC U CUAGGGU		ACCCUAG CUGAUGAG X CGAA IUCUCAU	
4193	GAGACUC U AGGGUCC		GGACCCU CUGAUGAG X CGAA IAGUCUC	
4200	UAGGGUC C AGUGGAU		AUCCACU CUGAUGAG X CGAA IACCCUA	
4201	AGGGUCC A GUGGAUG		CAUCCAC CUGAUGAG X CGAA IGACCCU	
4210	UGGAUGC C ACAGCCC		GGGCUGU CUGAUGAG X CGAA ICAUCCA	
4211	GGAUGCC A CAGCCCA		UGGGCUG CUGAUGAG X CGAA IGCAUCC	
4213	AUGCCAC A GCCCAGC		GCUGGGC CUGAUGAG X CGAA IUGGCAU	
4216	CCACAGC C CAGCUUG		CAAGCUG CUGAUGAG X CGAA ICUGUGG	

Table 34

4217	CACAGCC C AGCUUGG		CCAAGCU CUGAUGAG X CGAA IGCUGUG	
4218	ACAGCCC A GCUUGGC		GCCAAGC CUGAUGAG X CGAA IGGCUGU	
4221	GCCCAGC U UGGCCCU		AGGGCCA CUGAUGAG X CGAA ICUGGGC	
4226	GCUUGGC C CUUUCCU		AGGAAAG CUGAUGAG X CGAA ICCAAGC	
4227	CUUGGCC C UUUCCUU		AAGGAAA CUGAUGAG X CGAA IGCCAAG	
4228	UUGGCCC U UUCCUUC		GAAGGAA CUGAUGAG X CGAA IGGCCAA	
4232	CCCUUUC C UUCCAGA		UCUGGAA CUGAUGAG X CGAA IAAAGGG	
4233	CCUUUCC U UCCAGAU		AUCUGGA CUGAUGAG X CGAA IGAAAGG	
4236	UUCCUUC C AGAUCCU		AGGAUCU CUGAUGAG X CGAA IAAGGAA	
4237	UCCUUCC A GAUCCUG		CAGGAUC CUGAUGAG X CGAA IGAAGGA	
4242	CCAGAUC C UGGGUAC		GUACCCA CUGAUGAG X CGAA IAUCUGG	
4243	CAGAUCC U GGGUACU		AGUACCC CUGAUGAG X CGAA IGAUCUG	
4250	UGGGUAC U GAAAGCC		GGCUUUC CUGAUGAG X CGAA IUACCCA	
4257	UGAAAGC C UUAGGGA		UCCCUAA CUGAUGAG X CGAA ICUUUCA	
4258	GAAAGCC U UAGGGAA		UUCCCUA CUGAUGAG X CGAA IGCUUUC	
4268	GGGAAGC U GGCCUGA		UCAGGCC CUGAUGAG X CGAA ICUUCCC	
4272	AGCUGGC C UGAGAGG		CCUCUCA CUGAUGAG X CGAA ICCAGCU	
4273	GCUGGCC U GAGAGGG		CCCUCUC CUGAUGAG X CGAA IGCCAGC	
4289	AAGCGGC C CUAAGGG		CCCUUAG CUGAUGAG X CGAA ICCGCUU	
4290	AGCGGCC C UAAGGGA		UCCCUUA CUGAUGAG X CGAA IGCCGCU	
4291	GCGGCCC U AAGGGAG		CUCCCUU CUGAUGAG X CGAA IGGCCGC	
4303	GAGUGUC U AAGAACA		UGUUCUU CUGAUGAG X CGAA IACACUC	
4310	UAAGAAC A AAAGCGA		UCGCUUU CUGAUGAG X CGAA IUUCUUA	
4319	AAGCGAC C CAUUCAG		CUGAAUG CUGAUGAG X CGAA IUCGCUU	
4320	AGCGACC C AUUCAGA		UCUGAAU CUGAUGAG X CGAA IGUCGCU	
4321	GCGACCC A UUCAGAG		CUCUGAA CUGAUGAG X CGAA IGGUCGC	
4325	CCCAUUC A GAGACUG		CAGUCUC CUGAUGAG X CGAA IAAUGGG	
4331	CAGAGAC U GUCCCUG		CAGGGAC CUGAUGAG X CGAA IUCUCUG	
4335	GACUGUC C CUGAAAC		GUUUCAG CUGAUGAG X CGAA IACAGUC	
4336	ACUGUCC C UGAAACC		GGUUUCA CUGAUGAG X CGAA IGACAGU	
4337	CUGUCCC U GAAACCU		AGGUUUC CUGAUGAG X CGAA IGGACAG	
4343	CUGAAAC C UAGUACU		AGUACUA CUGAUGAG X CGAA IUUUCAG	
4344	UGAAACC U AGUACUG		CAGUACU CUGAUGAG X CGAA IGUUUCA	
4350	CUAGUAC U GCCCCCC		GGGGGGC CUGAUGAG X CGAA IUACUAG	
4353	GUACUGC C CCCCAUG		CAUGGGG CUGAUGAG X CGAA ICAGUAC	
4354	UACUGCC C CCCAUGA		UCAUGGG CUGAUGAG X CGAA IGCAGUA	
4355	ACUGCCC C CCAUGAG		CUCAUGG CUGAUGAG X CGAA IGGCAGU	
4356	CUGCCCC C CAUGAGG		CCUCAUG CUGAUGAG X CGAA IGGGCAG	
4357	UGCCCCC C AUGAGGA		UCCUCAU CUGAUGAG X CGAA IGGGGCA	
4358	GCCCCCC A UGAGGAA		UUCCUCA CUGAUGAG X CGAA IGGGGGC	
4371	AAGGAAC A GCAAUGG		CCAUUGC CUGAUGAG X CGAA IUUCCUU	
4374	GAACAGC A AUGGUGU		ACACCAU CUGAUGAG X CGAA ICUGUUC	
4383	UGGUGUC A GUAUCCA		UGGAUAC CUGAUGAG X CGAA IACACCA	
4389	CAGUAUC C AGGCUUU		AAAGCCU CUGAUGAG X CGAA IAUACUG	
4390	AGUAUCC A GGCUUUG		CAAAGCC CUGAUGAG X CGAA IGAUACU	
4394	UCCAGGC U UUGUACA		UGUACAA CUGAUGAG X CGAA ICCUGGA	
4401	UUUGUAC A GAGUGCU		AGCACUC CUGAUGAG X CGAA IUACAAA	

Table 34

4408	AGAGUGC U UUUCUGU		ACAGAAA CUGAUGAG X CGAA ICACUCU	
4413	GCUUUUC U GUUUAGU		ACUAAAC CUGAUGAG X CGAA IAAAAGC	
4427	UUUUUAC U UUUUUUG		CAAAAAA CUGAUGAG X CGAA IUAAAAA	
4464	UAAAGAC C CAGGGGG		CCCCCUG CUGAUGAG X CGAA IUCUUUA	
4465	AAAGACC C AGGGGGA		UCCCCCU CUGAUGAG X CGAA IGUCUUU	
4466	AAGACCC A GGGGGAG		CUCCCCC CUGAUGAG X CGAA IGGUCUU	

Seq Accession No. = HSERB2R (Human c-erb-B-2 mRNA; 4473 bp)
Core Sequence = CUGAUGAG X CGAA (X = GCCGAAAGGC or other stem II)

Table 35

Table 35: HBV Strains and Accession numbers

Accession Number	Name
AF100308.1	AF100308 Hepatitis B virus strain 2-18, complete
AB026815.1	AB026815 Hepatitis B virus DNA, complete genome,
AB033559.1	AB033559 Hepatitis B virus DNA, complete genome,
AB033558.1	AB033558 Hepatitis B virus DNA, complete genome,
AB033557.1	AB033557 Hepatitis B virus DNA, complete genome,
AB033556.1	AB033556 Hepatitis B virus DNA, complete genome,
AB033555.1	AB033555 Hepatitis B virus DNA, complete genome,
AB033554.1	AB033554 Hepatitis B virus DNA, complete genome,
AB033553.1	AB033553 Hepatitis B virus DNA, complete genome,
AB033552.1	AB033552 Hepatitis B virus DNA, complete genome,
AB033551.1	AB033551 Hepatitis B virus DNA, complete genome,
AB033550.1	AB033550 Hepatitis B virus DNA, complete genome
AF143308.1	AF143308 Hepatitis B virus clone WB1254, complete
AF143307.1	AF143307 Hepatitis B virus clone RM518, complete
AF143306.1	AF143306 Hepatitis B virus clone RM517, complete
AF143305.1	AF143305 Hepatitis B virus clone RM501, complete
AF143304.1	AF143304 Hepatitis B virus clone HD319, complete
AF143303.1	AF143303 Hepatitis B virus clone HD1406, complete
AF143302.1	AF143302 Hepatitis B virus clone HD1402, complete
AF143301.1	AF143301 Hepatitis B virus clone BW1903, complete
AF143300.1	AF143300 Hepatitis B virus clone 7832-G4, complete
AF143299.1	AF143299 Hepatitis B virus clone 7744-G9, complete
AF143298.1	AF143298 Hepatitis B virus clone 7720-G8, complete
AB026814.1	AB026814 Hepatitis B virus DNA, complete genome,
AB026813.1	AB026813 Hepatitis B virus DNA, complete genome,
AB026812.1	AB026812 Hepatitis B virus DNA, complete genome,
AB026811.1	AB026811 Hepatitis B virus DNA, complete genome,
AJ131956.1	HBV131956 Hepatitis B virus complete genome,
AF151735.1	AF151735 Hepatitis B virus, complete genome
AF090842.1	AF090842 Hepatitis B virus strain G5.27295, complete
AF090841.1	AF090841 Hepatitis B virus strain G4.27241, complete
AF090840.1	AF090840 Hepatitis B virus strain G3.27270, complete
AF090839.1	AF090839 Hepatitis B virus strain G2.27246, complete
AF090838.1	AF090838 Hepatitis B virus strain P1.27239, complete
Y18858.1	HBV18858 Hepatitis B virus complete genome, isolate
Y18857.1	HBV18857 Hepatitis B virus complete genome, isolate
D12980.1	HPBCG Hepatitis B virus subtype adr(SRADR) DNA,
Y18856.1	HBV18856 Hepatitis B virus complete genome, isolate
Y18855.1	HBV18855 Hepatitis B virus complete genome, isolate
AJ131133.1	HBV131133 Hepatitis B virus, complete genome, strain
X80925.1	HBVP6PCXX Hepatitis B virus (patient 6) complete
X80926.1	HBVP5PCXX Hepatitis B virus (patient 5) complete
X80924.1	HBVP4PCXX Hepatitis B virus (patient 4) complete
AF100309.1	Hepatitis B virus strain 56, complete genome

Table 35

AF068756.1	AF068756 Hepatitis B virus, complete genome
AF043593.1	AF043593 Hepatitis B virus isolate 6/89, complete
Y07587.1	HBVAYWGEN Hepatitis B virus, complete genome
D28880.1	D28880 Hepatitis B virus DNA, complete genome, strain
X98076.1	HBVDEFVP3 Hepatitis B virus complete genome with
X98075.1	HBVDEFVP2 Hepatitis B virus complete genome with
X98074.1	HBVDEFVP1 Hepatitis B virus complete genome with
X98077.1	HBVCGWITY Hepatitis B virus complete genome, wild type
X98072.1	HBVCGINSC Hepatitis B virus complete genome with
X98073.1	HBVCGINCX Hepatitis B virus complete genome with
U95551.1	U95551 Hepatitis B virus subtype ayw, complete genome
D23684.1	HPBC6T588 Hepatitis B virus (C6-TKB588) complete genome
D23683.1	HPBC5HKO2 Hepatitis B virus (C5-HBVKO2) complete genome
D23682.1	HPBB5HKO1 Hepatitis B virus (B5-HBVKO1) complete genome
D23681.1	HPBC4HST2 Hepatitis B virus (C4-HBVST2) complete genome
D23680.1	HPBB4HST1 Hepatitis B virus (B4-HBVST1) complete genome
D00331.1	HPBADW3 Hepatitis B virus genome, complete genome
D00330.1	HPBADW2 Hepatitis B virus genome, complete genome
D50489.1	HPBA11A Hepatitis B virus DNA, complete genome
D23679.1	HPBA3HMS2 Hepatitis B virus (A3-HBVMS2) complete genome
D23678.1	HPBA2HYS2 Hepatitis B virus (A2-HBVYS2) complete genome
D23677.1	HPBA1HKK2 Hepatitis B virus (A1-HBVKK2) complete genome
D16665.1	HPBADRM Hepatitis B virus DNA, complete genome
D00329.1	HPBADW1 Hepatitis B virus (HBV) genome, complete genome
X97851.1	HBVP6CSX Hepatitis B virus (patient 6) complete genome
X97850.1	HBVP4CSX Hepatitis B virus (patient 4) complete genome
X97849.1	HBVP3CSX Hepatitis B virus (patient 3) complete genome
X97848.1	HBVP2CSX Hepatitis B virus (patient 2) complete genome
X51970.1	HVHEPB Hepatitis B virus (HBV 991) complete genome
M38636.1	HPBCGADR Hepatitis B virus, subtype adr, complete genome
X59795.1	HBVAYWMCG Hepatitis B virus (ayw subtype mutant)
M38454.1	HPBADR1CG Hepatitis B virus , complete genome
M32138.1	HPBHBVAA Hepatitis B virus variant HBV-alpha1, complete
J02203.1	HPBAYW Human hepatitis B virus (subtype ayw), complete
M12906.1	HPBADRA Hepatitis B virus subtype adr, complete genome
M54923.1	HPBADWZ Hepatitis B virus (subtype adw), complete genome
L27106.1	HPBMUT Hepatitis B virus mutant complete genome

Table 36

Table 36: HBV Substrate Sequence

NT Position*	Substrate	Seq ID
82	CUAUCGUCCCCUUCUUCAUC	1
101	CUACCGUUCCGGCC	2
159	CUUCUCAUCU	3
184	CUUCCCUUCACCAC	4
269	GACUCUCAGAAUGUCAACGAC	5
381	CUGUAGGCAUAAAUGGUCUG	6
401	GUUCACCAGCACCAUGCAACUUUUU	7
424	UUUCACGUCUGCCUAAUCAUC	8
524	AUUUGGAGCUUC	9
562	CUGACUUCUUUCCUUCUAUUC	10
649	CUCACCAUACCGCACUCA	11
667	GGCAAGCUAUUCUGUG	12
717	GGAAGUAAUUUGGAAGAC	13
758	CAGCUAUGUCAAUGUUAA	14
783	CUAAAAUCGGCCUAAAAUCAGAC	15
812	CAUUUCCUGUCUCACUUUUGGAAGAG	16
887	UCCUGCUUACAGAC	17
922	CAACACUUCCGGAAACUACUGUUGUUAG	18
989	CUCGCCUCGCAGACGAAGGUCUC	19
1009	CAAUCGCCGCGUCGCAGAAG	20
1031	AUCUCAAUCUCGGGAAUCUCAA	21
1052	AUGUUAGUAUCCCUUGGACUC	22
1072	CAUAAGGUGGGAAACUUUACUG	23
1109	CUGUACCUAUUCUUUAAAUCC	24
1127	CUGAGUGGCAAACUCCC	25
1271	CCAAAUAUCUGCCCUUGGACAA	26
1297	AUUAAACCAUAUUAUCCUGAACA	27
1319	AUGCAGUUAAUCAUUACUUCAAAACUA	28
1340	AAACUAGGCAUUA	29
1370	AGGCGGGCAUUCUAUAUAAGAGAG	30
1393	GAAACUACGCGCAGCGCCUCAUUUUGU	31
1412	CAUUUUGUGGGUCACCAUA	32
1441	CAAGAGCUACAGCAUGGG	33

LOCUS HPBADR1CG 3221 bp DNA circular VRL
06-MAR-1995
DEFINITION Hepatitis B virus , complete genome.
ACCESSION M38454

*The nucleotide number referred to in that table is the position of the 5' end of the oligo in this sequence.

Table 37

Table 37: Human HBV Hammerhead Ribozyme and Target Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
13	CCACCACT T TCCACCAA	34	UUGGUGGA CUGAUGAG X CGAA AGUGGUGG	2543
14	CACCACTT T CCACCAAA	35	UUUGGUGG CUGAUGAG X CGAA AAGUGGUG	2544
15	ACCACTTT C CACCAAAC	36	GUUUGGUG CUGAUGAG X CGAA AAAGUGGU	2545
25	ACCAAACT C TTCAAGAT	37	AUCUUGAA CUGAUGAG X CGAA AGUUUGGU	2546
27	CAAACTCT T CAAGATCC	38	GGAUCUUG CUGAUGAG X CGAA AGAGUUUG	2547
28	AAACTCTT C AAGATCCC	39	GGGAUCUU CUGAUGAG X CGAA AAGAGUUU	2548
34	TTCAAGAT C CCAGAGTC	40	GACUCUGG CUGAUGAG X CGAA AUCUUGAA	2549
42	CCCAGAGT C AGGGCCCT	41	AGGGCCCU CUGAUGAG X CGAA ACUCUGGG	2550
53	GGCCCTGT A CTTTCCTG	42	CAGGAAAG CUGAUGAG X CGAA ACAGGGCC	2551
56	CCTGTACT T TCCTGCTG	43	CAGCAGGA CUGAUGAG X CGAA AGUACAGG	2552
57	CTGTACTT T CCTGCTGG	44	CCAGCAGG CUGAUGAG X CGAA AAGUACAG	2553
58	TGTACTTT C CTGCTGGT	45	ACCAGCAG CUGAUGAG X CGAA AAAGUACA	2554
71	TGGTGGCT C CAGTTCAG	46	CUGAACUG CUGAUGAG X CGAA AGCCACCA	2555
76	GCTCCAGT T CAGGAACA	47	UGUUCCUG CUGAUGAG X CGAA ACUGGAGC	2556
77	CTCCAGTT C AGGAACAG	48	CUGUUCCU CUGAUGAG X CGAA AACUGGAG	2557
97	GCCCTGCT C AGAATACT	49	AGUAUUCU CUGAUGAG X CGAA AGCAGGGC	2558
103	CTCAGAAT A CTGTCTCT	50	AGAGACAG CUGAUGAG X CGAA AUUCUGAG	2559
108	AATACTGT C TCTGCCAT	51	AUGGCAGA CUGAUGAG X CGAA ACAGUAUU	2560
110	TACTGTCT C TGCCATAT	52	AUAUGGCA CUGAUGAG X CGAA AGACAGUA	2561
117	TCTGCCAT A TCGTCAAT	53	AUUGACGA CUGAUGAG X CGAA AUGGCAGA	2562
119	TGCCATAT C GTCAATCT	54	AGAUUGAC CUGAUGAG X CGAA AUAUGGCA	2563
122	CATATCGT C AATCTTAT	55	AUAAGAUU CUGAUGAG X CGAA ACGAUAUG	2564
126	TCGTCAAT C TTATCGAA	56	UUCGAUAA CUGAUGAG X CGAA AUUGACGA	2565
128	GTCAATCT T ATCGAAGA	57	UCUUCGAU CUGAUGAG X CGAA AGAUUGAC	2566
129	TCAATCTT A TCGAAGAC	58	GUCUUCGA CUGAUGAG X CGAA AAGAUUGA	2567
131	AATCTTAT C GAAGACTG	59	CAGUCUUC CUGAUGAG X CGAA AUAAGAUU	2568
150	GACCCTGT A CCGAACAT	60	AUGUUCGG CUGAUGAG X CGAA ACAGGGUC	2569
168	GAGAACAT C GCATCAGG	61	CCUGAUGC CUGAUGAG X CGAA AUGUUCUC	2570
173	CATCGCAT C AGGACTCC	62	GGAGUCCU CUGAUGAG X CGAA AUGCGAUG	2571
180	TCAGGACT C CTAGGACC	63	GGUCCUAG CUGAUGAG X CGAA AGUCCUGA	2572
183	GGACTCCT A GGACCCCT	64	AGGGGUCC CUGAUGAG X CGAA AGGAGUCC	2573
195	CCCCTGCT C GTGTTACA	65	UGUAACAC CUGAUGAG X CGAA AGCAGGGG	2574
200	GCTCGTGT T ACAGGCGG	66	CCGCCUGU CUGAUGAG X CGAA ACACGAGC	2575
201	CTCGTGTT A CAGGCGGG	67	CCCGCCUG CUGAUGAG X CGAA AACACGAG	2576
212	GGCGGGGT T TTTCTTGT	68	ACAAGAAA CUGAUGAG X CGAA ACCCCGCC	2577
213	GCGGGGTT T TTCTTGTT	69	AACAAGAA CUGAUGAG X CGAA AACCCCGC	2578
214	CGGGGTTT T TCTTGTTG	70	CAACAAGA CUGAUGAG X CGAA AAACCCCG	2579
215	GGGGTTTT T CTTGTTGA	71	UCAACAAG CUGAUGAG X CGAA AAAACCCC	2580
216	GGGTTTTT C TTGTTGAC	72	GUCAACAA CUGAUGAG X CGAA AAAAACCC	2581
218	GTTTTTCT T GTTGACAA	73	UUGUCAAC CUGAUGAG X CGAA AGAAAAAC	2582
221	TTTCTTGT T GACAAAAA	74	UUUUUGUC CUGAUGAG X CGAA ACAAGAAA	2583
231	ACAAAAAT C CTCACAAT	75	AUUGUGAG CUGAUGAG X CGAA AUUUUUGU	2584
234	AAAATCCT C ACAATACC	76	GGUAUUGU CUGAUGAG X CGAA AGGAUUUU	2585
240	CTCACAAT A CCACAGAG	77	CUCUGUGG CUGAUGAG X CGAA AUUGUGAG	2586
250	CACAGAGT C TAGACTCG	78	CGAGUCUA CUGAUGAG X CGAA ACUCUGUG	2587
252	CAGAGTCT A GACTCGTG	79	CACGAGUC CUGAUGAG X CGAA AGACUCUG	2588
257	TCTAGACT C GTGGTGGA	80	UCCACCAC CUGAUGAG X CGAA AGUCUAGA	2589
268	GGTGGACT T CTCTCAAT	81	AUUGAGAG CUGAUGAG X CGAA AGUCCACC	2590

Table 37

269	GTGGACTT C TCTCAATT	82	AAUUGAGA CUGAUGAG X CGAA AAGUCCAC	2591
271	GGACTTCT C TCAATTTT	83	AAAAUUGA CUGAUGAG X CGAA AGAAGUCC	2592
273	ACTTCTCT C AATTTTCT	84	AGAAAAUU CUGAUGAG X CGAA AGAGAAGU	2593
277	CTCTCAAT T TTCTAGGG	85	CCCUAGAA CUGAUGAG X CGAA AUUGAGAG	2594
278	TCTCAATT T TCTAGGGG	86	CCCCUAGA CUGAUGAG X CGAA AAUUGAGA	2595
279	CTCAATTT T CTAGGGGG	87	CCCCCUAG CUGAUGAG X CGAA AAAUUGAG	2596
280	TCAATTTT C TAGGGGGA	88	UCCCCCUA CUGAUGAG X CGAA AAAAUUGA	2597
282	AATTTTCT A GGGGGAAC	89	GUUCCCCC CUGAUGAG X CGAA AGAAAAUU	2598
301	CCGTGTGT C TTGGCCAA	90	UUGGCCAA CUGAUGAG X CGAA ACACACGG	2599
303	GTGTGTCT T GGCCAAAA	91	UUUUGGCC CUGAUGAG X CGAA AGACACAC	2600
313	GCCAAAAT T CGCAGTCC	92	GGACUGCG CUGAUGAG X CGAA AUUUUGGC	2601
314	CCAAAATT C GCAGTCCC	93	GGGACUGC CUGAUGAG X CGAA AAUUUUGG	2602
320	TTCGCAGT C CCAAATCT	94	AGAUUUGG CUGAUGAG X CGAA ACUGCGAA	2603
327	TCCCAAAT C TCCAGTCA	95	UGACUGGA CUGAUGAG X CGAA AUUUGGGA	2604
329	CCAAATCT C CAGTCACT	96	AGUGACUG CUGAUGAG X CGAA AGAUUUGG	2605
334	TCTCCAGT C ACTCACCA	97	UGGUGAGU CUGAUGAG X CGAA ACUGGAGA	2606
338	CAGTCACT C ACCAACCT	98	AGGUUGGU CUGAUGAG X CGAA AGUGACUG	2607
349	CAACCTGT T GTCCTCCA	99	UGGAGGAC CUGAUGAG X CGAA ACAGGUUG	2608
352	CCTGTTGT C CTCCAATT	100	AAUUGGAG CUGAUGAG X CGAA ACAACAGG	2609
355	GTTGTCCT C CAATTTGT	101	ACAAAUUG CUGAUGAG X CGAA AGGACAAC	2610
360	CCTCCAAT T TGTCCTGG	102	CCAGGACA CUGAUGAG X CGAA AUUGGAGG	2611
361	CTCCAATT T GTCCTGGT	103	ACCAGGAC CUGAUGAG X CGAA AAUUGGAG	2612
364	CAATTTGT C CTGGTTAT	104	AUAACCAG CUGAUGAG X CGAA ACAAAUUG	2613
370	GTCCTGGT T ATCGCTGG	105	CCAGCGAU CUGAUGAG X CGAA ACCAGGAC	2614
371	TCCTGGTT A TCGCTGGA	106	UCCAGCGA CUGAUGAG X CGAA AACCAGGA	2615
373	CTGGTTAT C GCTGGATG	107	CAUCCAGC CUGAUGAG X CGAA AUAACCAG	2616
385	GGATGTGT C TGCGGCGT	108	ACGCCGCA CUGAUGAG X CGAA ACACAUCC	2617
394	TGCGGCGT T TTATCATC	109	GAUGAUAA CUGAUGAG X CGAA ACGCCGCA	2618
395	GCGGCGTT T TATCATCT	110	AGAUGAUA CUGAUGAG X CGAA AACGCCGC	2619
396	CGGCGTTT T ATCATCTT	111	AAGAUGAU CUGAUGAG X CGAA AAACGCCG	2620
397	GGCGTTTT A TCATCTTC	112	GAAGAUGA CUGAUGAG X CGAA AAAACGCC	2621
399	CGTTTTAT C ATCTTCCT	113	AGGAAGAU CUGAUGAG X CGAA AUAAAACG	2622
402	TTTATCAT C TTCCTCTG	114	CAGAGGAA CUGAUGAG X CGAA AUGAUAAA	2623
404	TATCATCT T CCTCTGCA	115	UGCAGAGG CUGAUGAG X CGAA AGAUGAUA	2624
405	ATCATCTT C CTCTGCAT	116	AUGCAGAG CUGAUGAG X CGAA AAGAUGAU	2625
408	ATCTTCCT C TGCATCCT	117	AGGAUGCA CUGAUGAG X CGAA AGGAAGAU	2626
414	CTCTGCAT C CTGCTGCT	118	AGCAGCAG CUGAUGAG X CGAA AUGCAGAG	2627
423	CTGCTGCT A TGCCTCAT	119	AUGAGGCA CUGAUGAG X CGAA AGCAGCAG	2628
429	CTATGCCT C ATCTTCTT	120	AAGAAGAU CUGAUGAG X CGAA AGGCAUAG	2629
432	TGCCTCAT C TTCTTGTT	121	AACAAGAA CUGAUGAG X CGAA AUGAGGCA	2630
434	CCTCATCT T CTTGTTGG	122	CCAACAAG CUGAUGAG X CGAA AGAUGAGG	2631
435	CTCATCTT C TTGTTGGT	123	ACCAACAA CUGAUGAG X CGAA AAGAUGAG	2632
437	CATCTTCT T GTTGGTTC	124	GAACCAAC CUGAUGAG X CGAA AGAAGAUG	2633
440	CTTCTTGT T GGTTCTTC	125	GAAGAACC CUGAUGAG X CGAA ACAAGAAG	2634
444	TTGTTGGT T CTTCTGGA	126	UCCAGAAG CUGAUGAG X CGAA ACCAACAA	2635
445	TGTTGGTT C TTCTGGAC	127	GUCCAGAA CUGAUGAG X CGAA AACCAACA	2636
447	TTGGTTCT T CTGGACTA	128	UAGUCCAG CUGAUGAG X CGAA AGAACCAA	2637
448	TGGTTCTT C TGGACTAT	129	AUAGUCCA CUGAUGAG X CGAA AAGAACCA	2638
455	TCTGGACT A TCAAGGTA	130	UACCUUGA CUGAUGAG X CGAA AGUCCAGA	2639
457	TGGACTAT C AAGGTATG	131	CAUACCUU CUGAUGAG X CGAA AUAGUCCA	2640
463	ATCAAGGT A TGTTGCCC	132	GGGCAACA CUGAUGAG X CGAA ACCUUGAU	2641

Table 37

467	AGGTATGT T GCCCGTTT	133	AAACGGGC CUGAUGAG X CGAA ACAUACCU	2642
474	TTGCCCGT T TGTCCTCT	134	AGAGGACA CUGAUGAG X CGAA ACGGGCAA	2643
475	TGCCCGTT T GTCCTCTA	135	UAGAGGAC CUGAUGAG X CGAA AACGGGCA	2644
478	CCGTTTGT C CTCTAATT	136	AAUUAGAG CUGAUGAG X CGAA ACAAACGG	2645
481	TTTGTCCT C TAATTCCA	137	UGGAAUUA CUGAUGAG X CGAA AGGACAAA	2646
483	TGTCCTCT A ATTCCAGG	138	CCUGGAAU CUGAUGAG X CGAA AGAGGACA	2647
486	CCTCTAAT T CCAGGATC	139	GAUCCUGG CUGAUGAG X CGAA AUUAGAGG	2648
487	CTCTAATT C CAGGATCA	140	UGAUCCUG CUGAUGAG X CGAA AAUUAGAG	2649
494	TCCAGGAT C ATCAACAA	141	UUGUUGAU CUGAUGAG X CGAA AUCCUGGA	2650
497	AGGATCAT C AACAACCA	142	UGGUUGUU CUGAUGAG X CGAA AUGAUCCU	2651
535	GCACAACT C CTGCTCAA	143	UUGAGCAG CUGAUGAG X CGAA AGUUGUGC	2652
541	CTCCTGCT C AAGGAACC	144	GGUUCCUU CUGAUGAG X CGAA AGCAGGAG	2653
551	AGGAACCT C TATGTTTC	145	GAAACAUA CUGAUGAG X CGAA AGGUUCCU	2654
553	GAACCTCT A TGTTTCCC	146	GGGAAACA CUGAUGAG X CGAA AGAGGUUC	2655
557	CTCTATGT T TCCCTCAT	147	AUGAGGGA CUGAUGAG X CGAA ACAUAGAG	2656
558	TCTATGTT T CCCTCATG	148	CAUGAGGG CUGAUGAG X CGAA AACAUAGA	2657
559	CTATGTTT C CCTCATGT	149	ACAUGAGG CUGAUGAG X CGAA AAACAUAG	2658
563	GTTTCCCT C ATGTTGCT	150	AGCAACAU CUGAUGAG X CGAA AGGGAAAC	2659
568	CCTCATGT T GCTGTACA	151	UGUACAGC CUGAUGAG X CGAA ACAUGAGG	2660
574	GTTGCTGT A CAAAACCT	152	AGGUUUUG CUGAUGAG X CGAA ACAGCAAC	2661
583	CAAAACCT A CGGACGGA	153	UCCGUCCG CUGAUGAG X CGAA AGGUUUUG	2662
604	GCACCTGT A TTCCCATC	154	GAUGGGAA CUGAUGAG X CGAA ACAGGUGC	2663
606	ACCTGTAT T CCCATCCC	155	GGGAUGGG CUGAUGAG X CGAA AUACAGGU	2664
607	CCTGTATT C CCATCCCA	156	UGGGAUGG CUGAUGAG X CGAA AAUACAGG	2665
612	ATTCCCAT C CCATCATC	157	GAUGAUGG CUGAUGAG X CGAA AUGGGAAU	2666
617	CATCCCAT C ATCTTGGG	158	CCCAAGAU CUGAUGAG X CGAA AUGGGAUG	2667
620	CCCATCAT C TTGGGCTT	159	AAGCCCAA CUGAUGAG X CGAA AUGAUGGG	2668
622	CATCATCT T GGGCTTTC	160	GAAAGCCC CUGAUGAG X CGAA AGAUGAUG	2669
628	CTTGGGCT T TCGCAAAA	161	UUUUGCGA CUGAUGAG X CGAA AGCCCAAG	2670
629	TTGGGCTT T CGCAAAAT	162	AUUUUGCG CUGAUGAG X CGAA AAGCCCAA	2671
630	TGGGCTTT C GCAAAATA	163	UAUUUUGC CUGAUGAG X CGAA AAAGCCCA	2672
638	CGCAAAAT A CCTATGGG	164	CCCAUAGG CUGAUGAG X CGAA AUUUUGCG	2673
642	AAATACCT A TGGGAGTG	165	CACUCCCA CUGAUGAG X CGAA AGGUAUUU	2674
656	GTGGGCCT C AGTCCGTT	166	AACGGACU CUGAUGAG X CGAA AGGCCCAC	2675
660	GCCTCAGT C CGTTTCTC	167	GAGAAACG CUGAUGAG X CGAA ACUGAGGC	2676
664	CAGTCCGT T TCTCTTGG	168	CCAAGAGA CUGAUGAG X CGAA ACGGACUG	2677
665	AGTCCGTT T CTCTTGGC	169	GCCAAGAG CUGAUGAG X CGAA AACGGACU	2678
666	GTCCGTTT C TCTTGGCT	170	AGCCAAGA CUGAUGAG X CGAA AAACGGAC	2679
668	CCGTTTCT C TTGGCTCA	171	UGAGCCAA CUGAUGAG X CGAA AGAAACGG	2680
670	GTTTCTCT T GGCTCAGT	172	ACUGAGCC CUGAUGAG X CGAA AGAGAAAC	2681
675	TCTTGGCT C AGTTTACT	173	AGUAAACU CUGAUGAG X CGAA AGCCAAGA	2682
679	GGCTCAGT T TACTAGTG	174	CACUAGUA CUGAUGAG X CGAA ACUGAGCC	2683
680	GCTCAGTT T ACTAGTGC	175	GCACUAGU CUGAUGAG X CGAA AACUGAGC	2684
681	CTCAGTTT A CTAGTGCC	176	GGCACUAG CUGAUGAG X CGAA AAACUGAG	2685
684	AGTTTACT A GTGCCATT	177	AAUGGCAC CUGAUGAG X CGAA AGUAAACU	2686
692	AGTGCCAT T TGTTCAGT	178	ACUGAACA CUGAUGAG X CGAA AUGGCACU	2687
693	GTGCCATT T GTTCAGTG	179	CACUGAAC CUGAUGAG X CGAA AAUGGCAC	2688
696	CCATTTGT T CAGTGGTT	180	AACCACUG CUGAUGAG X CGAA ACAAAUGG	2689
697	CATTTGTT C AGTGGTTC	181	GAACCACU CUGAUGAG X CGAA AACAAAUG	2690
704	TCAGTGGT T CGTAGGGC	182	GCCCUACG CUGAUGAG X CGAA ACCACUGA	2691
705	CAGTGGTT C GTAGGGCT	183	AGCCCUAC CUGAUGAG X CGAA AACCACUG	2692

Table 37

708	TGGTTCGT A GGGCTTTC	184	GAAAGCCC CUGAUGAG X CGAA ACGAACCA	2693
714	GTAGGGCT T TCCCCCAC	185	GUGGGGGA CUGAUGAG X CGAA AGCCCUAC	2694
715	TAGGGCTT T CCCCCACT	186	AGUGGGGG CUGAUGAG X CGAA AAGCCCUA	2695
716	AGGGCTTT C CCCCACTG	187	CAGUGGGG CUGAUGAG X CGAA AAAGCCCU	2696
726	CCCACTGT C TGGCTTTC	188	GAAAGCCA CUGAUGAG X CGAA ACAGUGGG	2697
732	GTCTGGCT T TCAGTTAT	189	AUAACUGA CUGAUGAG X CGAA AGCCAGAC	2698
733	TCTGGCTT T CAGTTATA	190	UAUAACUG CUGAUGAG X CGAA AAGCCAGA	2699
734	CTGGCTTT C AGTTATAT	191	AUAUAACU CUGAUGAG X CGAA AAAGCCAG	2700
738	CTTTCAGT T ATATGGAT	192	AUCCAUAU CUGAUGAG X CGAA ACUGAAAG	2701
739	TTTCAGTT A TATGGATG	193	CAUCCAUA CUGAUGAG X CGAA AACUGAAA	2702
741	TCAGTTAT A TGGATGAT	194	AUCAUCCA CUGAUGAG X CGAA AUAACUGA	2703
755	GATGTGGT T TTGGGGGC	195	GCCCCCAA CUGAUGAG X CGAA ACCACAUC	2704
756	ATGTGGTT T TGGGGGCC	196	GGCCCCCA CUGAUGAG X CGAA AACCACAU	2705
757	TGTGGTTT T GGGGGCCA	197	UGGCCCCC CUGAUGAG X CGAA AAACCACA	2706
769	GGCCAAGT C TGTACAAC	198	GUUGUACA CUGAUGAG X CGAA ACUUGGCC	2707
773	AAGTCTGT A CAACATCT	199	AGAUGUUG CUGAUGAG X CGAA ACAGACUU	2708
780	TACAACAT C TTGAGTCC	200	GGACUCAA CUGAUGAG X CGAA AUGUUGUA	2709
782	CAACATCT T GAGTCCCT	201	AGGGACUC CUGAUGAG X CGAA AGAUGUUG	2710
787	TCTTGAGT C CCTTTATG	202	CAUAAAGG CUGAUGAG X CGAA ACUCAAGA	2711
791	GAGTCCCT T TATGCCGC	203	GCGGCAUA CUGAUGAG X CGAA AGGGACUC	2712
792	AGTCCCTT T ATGCCGCT	204	AGCGGCAU CUGAUGAG X CGAA AAGGGACU	2713
793	GTCCCTTT A TGCCGCTG	205	CAGCGGCA CUGAUGAG X CGAA AAAGGGAC	2714
803	GCCGCTGT T ACCAATTT	206	AAAUUGGU CUGAUGAG X CGAA ACAGCGGC	2715
804	CCGCTGTT A CCAATTTT	207	AAAAUUGG CUGAUGAG X CGAA AACAGCGG	2716
810	TTACCAAT T TTCTTTTG	208	CAAAAGAA CUGAUGAG X CGAA AUUGGUAA	2717
811	TACCAATT T TCTTTTGT	209	ACAAAAGA CUGAUGAG X CGAA AAUUGGUA	2718
812	ACCAATTT T CTTTTGTC	210	GACAAAAG CUGAUGAG X CGAA AAAUUGGU	2719
813	CCAATTTT C TTTTGTCT	211	AGACAAAA CUGAUGAG X CGAA AAAAUUGG	2720
815	AATTTTCT T TTGTCTTT	212	AAAGACAA CUGAUGAG X CGAA AGAAAAUU	2721
816	ATTTTCTT T TGTCTTTG	213	CAAAGACA CUGAUGAG X CGAA AAGAAAAU	2722
817	TTTTCTTT T GTCTTTGG	214	CCAAAGAC CUGAUGAG X CGAA AAAGAAAA	2723
820	TCTTTTGT C TTTGGGTA	215	UACCCAAA CUGAUGAG X CGAA ACAAAAGA	2724
822	TTTTGTCT T TGGGTATA	216	UAUACCCA CUGAUGAG X CGAA AGACAAAA	2725
823	TTTGTCTT T GGGTATAC	217	GUAUACCC CUGAUGAG X CGAA AAGACAAA	2726
828	CTTTGGGT A TACATTTA	218	UAAAUGUA CUGAUGAG X CGAA ACCCAAAG	2727
830	TTGGGTAT A CATTTAAA	219	UUUAAAUG CUGAUGAG X CGAA AUACCCAA	2728
834	GTATACAT T TAAACCCT	220	AGGGUUUA CUGAUGAG X CGAA AUGUAUAC	2729
835	TATACATT T AAACCCTC	221	GAGGGUUU CUGAUGAG X CGAA AAUGUAUA	2730
836	ATACATTT A AACCCTCA	222	UGAGGGUU CUGAUGAG X CGAA AAAUGUAU	2731
843	TAAACCCT C ACAAAACA	223	UGUUUUGU CUGAUGAG X CGAA AGGGUUUA	2732
865	ATGGGGAT A TTCCCTTA	224	UAAGGGAA CUGAUGAG X CGAA AUCCCCAU	2733
867	GGGGATAT T CCCTTAAC	225	GUUAAGGG CUGAUGAG X CGAA AUAUCCCC	2734
868	GGGATATT C CCTTAACT	226	AGUUAAGG CUGAUGAG X CGAA AAUAUCCC	2735
872	TATTCCCT T AACTTCAT	227	AUGAAGUU CUGAUGAG X CGAA AGGGAAUA	2736
873	ATTCCCTT A ACTTCATG	228	CAUGAAGU CUGAUGAG X CGAA AAGGGAAU	2737
877	CCTTAACT T CATGGGAT	229	AUCCCAUG CUGAUGAG X CGAA AGUUAAGG	2738
878	CTTAACTT C ATGGGATA	230	UAUCCCAU CUGAUGAG X CGAA AAGUUAAG	2739
886	CATGGGAT A TGTAATTG	231	CAAUUACA CUGAUGAG X CGAA AUCCCAUG	2740
890	GGATATGT A ATTGGGAG	232	CUCCCAAU CUGAUGAG X CGAA ACAUAUCC	2741
893	TATGTAAT T GGGAGTTG	233	CAACUCCC CUGAUGAG X CGAA AUUACAUA	2742
900	TTGGGAGT T GGGGCACA	234	UGUGCCCC CUGAUGAG X CGAA ACUCCCAA	2743

Table 37

910	GGGCACAT T GCCACAGG	235	CCUGUGGC CUGAUGAG X CGAA AUGUGCCC	2744
924	AGGAACAT A TTGTACAA	236	UUGUACAA CUGAUGAG X CGAA AUGUUCCU	2745
926	GAACATAT T GTACAAAA	237	UUUUGUAC CUGAUGAG X CGAA AUAUGUUC	2746
929	CATATTGT A CAAAAAAT	238	AUUUUUUG CUGAUGAG X CGAA ACAAUAUG	2747
938	CAAAAAAT C AAAATGTG	239	CACAUUUU CUGAUGAG X CGAA AUUUUUUG	2748
948	AAATGTGT T TTAGGAAA	240	UUUCCUAA CUGAUGAG X CGAA ACACAUUU	2749
949	AATGTGTT T TAGGAAAC	241	GUUUCCUA CUGAUGAG X CGAA AACACAUU	2750
950	ATGTGTTT T AGGAAACT	242	AGUUUCCU CUGAUGAG X CGAA AAACACAU	2751
951	TGTGTTTT A GGAAACTT	243	AAGUUUCC CUGAUGAG X CGAA AAAACACA	2752
959	AGGAAACT T CCTGTAAA	244	UUUACAGG CUGAUGAG X CGAA AGUUUCCU	2753
960	GGAAACTT C CTGTAAAC	245	GUUUACAG CUGAUGAG X CGAA AAGUUUCC	2754
965	CTTCCTGT A AACAGGCC	246	GGCCUGUU CUGAUGAG X CGAA ACAGGAAG	2755
975	ACAGGCCT A TTGATTGG	247	CCAAUCAA CUGAUGAG X CGAA AGGCCUGU	2756
977	AGGCCTAT T GATTGGAA	248	UUCCAAUC CUGAUGAG X CGAA AUAGGCCU	2757
981	CTATTGAT T GGAAAGTA	249	UACUUUCC CUGAUGAG X CGAA AUCAAUAG	2758
989	TGGAAAGT A TGTCAACG	250	CGUUGACA CUGAUGAG X CGAA ACUUUCCA	2759
993	AAGTATGT C AACGAATT	251	AAUUCGUU CUGAUGAG X CGAA ACAUACUU	2760
1001	CAACGAAT T GTGGGTCT	252	AGACCCAC CUGAUGAG X CGAA AUUCGUUG	2761
1008	TTGTGGGT C TTTTGGGG	253	CCCCAAAA CUGAUGAG X CGAA ACCCACAA	2762
1010	GTGGGTCT T TTGGGGTT	254	AACCCCAA CUGAUGAG X CGAA AGACCCAC	2763
1011	TGGGTCTT T TGGGGTTT	255	AAACCCCA CUGAUGAG X CGAA AAGACCCA	2764
1012	GGGTCTTT T GGGGTTTG	256	CAAACCCC CUGAUGAG X CGAA AAAGACCC	2765
1018	TTTGGGGT T TGCCGCCC	257	GGGCGGCA CUGAUGAG X CGAA ACCCCAAA	2766
1019	TTGGGGTT T GCCGCCCC	258	GGGGCGGC CUGAUGAG X CGAA AACCCCAA	2767
1029	CCGCCCCT T TCACGCAA	259	UUGCGUGA CUGAUGAG X CGAA AGGGGCGG	2768
1030	CGCCCCTT T CACGCAAT	260	AUUGCGUG CUGAUGAG X CGAA AAGGGGCG	2769
1031	GCCCCTTT C ACGCAATG	261	CAUUGCGU CUGAUGAG X CGAA AAAGGGGC	2770
1045	ATGTGGAT A TTCTGCTT	262	AAGCAGAA CUGAUGAG X CGAA AUCCACAU	2771
1047	GTGGATAT T CTGCTTTA	263	UAAAGCAG CUGAUGAG X CGAA AUAUCCAC	2772
1048	TGGATATT C TGCTTTAA	264	UUAAAGCA CUGAUGAG X CGAA AAUAUCCA	2773
1053	ATTCTGCT T TAATGCCT	265	AGGCAUUA CUGAUGAG X CGAA AGCAGAAU	2774
1054	TTCTGCTT T AATGCCTT	266	AAGGCAUU CUGAUGAG X CGAA AAGCAGAA	2775
1055	TCTGCTTT A ATGCCTTT	267	AAAGGCAU CUGAUGAG X CGAA AAAGCAGA	2776
1062	TAATGCCT T TATATGCA	268	UGCAUAUA CUGAUGAG X CGAA AGGCAUUA	2777
1063	AATGCCTT T ATATGCAT	269	AUGCAUAU CUGAUGAG X CGAA AAGGCAUU	2778
1064	ATGCCTTT A TATGCATG	270	CAUGCAUA CUGAUGAG X CGAA AAAGGCAU	2779
1066	GCCTTTAT A TGCATGCA	271	UGCAUGCA CUGAUGAG X CGAA AUAAAGGC	2780
1076	GCATGCAT A CAAGCAAA	272	UUUGCUUG CUGAUGAG X CGAA AUGCAUGC	2781
1092	AACAGGCT T TTACTTTC	273	GAAAGUAA CUGAUGAG X CGAA AGCCUGUU	2782
1093	ACAGGCTT T TACTTTCT	274	AGAAAGUA CUGAUGAG X CGAA AAGCCUGU	2783
1094	CAGGCTTT T ACTTTCTC	275	GAGAAAGU CUGAUGAG X CGAA AAAGCCUG	2784
1095	AGGCTTTT A CTTTCTCG	276	CGAGAAAG CUGAUGAG X CGAA AAAAGCCU	2785
1098	CTTTTACT T TCTCGCCA	277	UGGCGAGA CUGAUGAG X CGAA AGUAAAAG	2786
1099	TTTTACTT T CTCGCCAA	278	UUGGCGAG CUGAUGAG X CGAA AAGUAAAA	2787
1100	TTTACTTT C TCGCCAAC	279	GUUGGCGA CUGAUGAG X CGAA AAAGUAAA	2788
1102	TACTTTCT C GCCAACTT	280	AAGUUGGC CUGAUGAG X CGAA AGAAAGUA	2789
1110	CGCCAACT T ACAAGGCC	281	GGCCUUGU CUGAUGAG X CGAA AGUUGGCG	2790
1111	GCCAACTT A CAAGGCCT	282	AGGCCUUG CUGAUGAG X CGAA AAGUUGGC	2791
1120	CAAGGCCT T TCTAAGTA	283	UACUUAGA CUGAUGAG X CGAA AGGCCUUG	2792
1121	AAGGCCTT T CTAAGTAA	284	UUACUUAG CUGAUGAG X CGAA AAGGCCUU	2793
1122	AGGCCTTT C TAAGTAAA	285	UUUACUUA CUGAUGAG X CGAA AAAGGCCU	2794

Table 37

1124	GCCTTTCT A AGTAAACA	286	UGUUUACU CUGAUGAG X CGAA AGAAAGGC	2795
1128	TTCTAAGT A AACAGTAT	287	AUACUGUU CUGAUGAG X CGAA ACUUAGAA	2796
1135	TAAACAGT A TGTGAACC	288	GGUUCACA CUGAUGAG X CGAA ACUGUUUA	2797
1145	GTGAACCT T TACCCCGT	289	ACGGGGUA CUGAUGAG X CGAA AGGUUCAC	2798
1146	TGAACCTT T ACCCCGTT	290	AACGGGGU CUGAUGAG X CGAA AAGGUUCA	2799
1147	GAACCTTT A CCCCGTTG	291	CAACGGGG CUGAUGAG X CGAA AAAGGUUC	2800
1154	TACCCCGT T GCTCGGCA	292	UGCCGAGC CUGAUGAG X CGAA ACGGGGUA	2801
1158	CCGTTGCT C GGCAACGG	293	CCGUUGCC CUGAUGAG X CGAA AGCAACGG	2802
1173	GGCCTGGT C TATGCCAA	294	UUGGCAUA CUGAUGAG X CGAA ACCAGGCC	2803
1175	CCTGGTCT A TGCCAAGT	295	ACUUGGCA CUGAUGAG X CGAA AGACCAGG	2804
1186	CCAAGTGT T TGCTGACG	296	CGUCAGCA CUGAUGAG X CGAA ACACUUGG	2805
1187	CAAGTGTT T GCTGACGC	297	GCGUCAGC CUGAUGAG X CGAA AACACUUG	2806
1209	CCACTGGT T GGGGCTTG	298	CAAGCCCC CUGAUGAG X CGAA ACCAGUGG	2807
1216	TTGGGGCT T GGCCATAG	299	CUAUGGCC CUGAUGAG X CGAA AGCCCCAA	2808
1223	TTGGCCAT A GGCCATCA	300	UGAUGGCC CUGAUGAG X CGAA AUGGCCAA	2809
1230	TAGGCCAT C AGCGCATG	301	CAUGCGCU CUGAUGAG X CGAA AUGGCCUA	2810
1249	TGGAACCT T TGTGTCTC	302	GAGACACA CUGAUGAG X CGAA AGGUUCCA	2811
1250	GGAACCTT T GTGTCTCC	303	GGAGACAC CUGAUGAG X CGAA AAGGUUCC	2812
1255	CTTTGTGT C TCCTCTGC	304	GCAGAGGA CUGAUGAG X CGAA ACACAAAG	2813
1257	TTGTGTCT C CTCTGCCG	305	CGGCAGAG CUGAUGAG X CGAA AGACACAA	2814
1260	TGTCTCCT C TGCCGATC	306	GAUCGGCA CUGAUGAG X CGAA AGGAGACA	2815
1268	CTGCCGAT C CATACCGC	307	GCGGUAUG CUGAUGAG X CGAA AUCGGCAG	2816
1272	CGATCCAT A CCGCGGAA	308	UUCCGCGG CUGAUGAG X CGAA AUGGAUCG	2817
1283	GCGGAACT C CTAGCCGC	309	GCGGCUAG CUGAUGAG X CGAA AGUUCCGC	2818
1286	GAACTCCT A GCCGCTTG	310	CAAGCGGC CUGAUGAG X CGAA AGGAGUUC	2819
1293	TAGCCGCT T GTTTTGCT	311	AGCAAAAC CUGAUGAG X CGAA AGCGGCUA	2820
1296	CCGCTTGT T TTGCTCGC	312	GCGAGCAA CUGAUGAG X CGAA ACAAGCGG	2821
1297	CGCTTGTT T TGCTCGCA	313	UGCGAGCA CUGAUGAG X CGAA AACAAGCG	2822
1298	GCTTGTTT T GCTCGCAG	314	CUGCGAGC CUGAUGAG X CGAA AAACAAGC	2823
1302	GTTTTGCT C GCAGCAGG	315	CCUGCUGC CUGAUGAG X CGAA AGCAAAAC	2824
1312	CAGCAGGT C TGGGGCAA	316	UUGCCCCA CUGAUGAG X CGAA ACCUGCUG	2825
1325	GCAAAACT C ATCGGGAC	317	GUCCCGAU CUGAUGAG X CGAA AGUUUUGC	2826
1328	AAACTCAT C GGGACTGA	318	UCAGUCCC CUGAUGAG X CGAA AUGAGUUU	2827
1341	CTGACAAT T CTGTCGTG	319	CACGACAG CUGAUGAG X CGAA AUUGUCAG	2828
1342	TGACAATT C TGTCGTGC	320	GCACGACA CUGAUGAG X CGAA AAUUGUCA	2829
1346	AATTCTGT C GTGCTCTC	321	GAGAGCAC CUGAUGAG X CGAA ACAGAAUU	2830
1352	GTCGTGCT C TCCCGCAA	322	UUGCGGGA CUGAUGAG X CGAA AGCACGAC	2831
1354	CGTGCTCT C CCGCAAAT	323	AUUUGCGG CUGAUGAG X CGAA AGAGCACG	2832
1363	CCGCAAAT A TACATCAT	324	AUGAUGUA CUGAUGAG X CGAA AUUUGCGG	2833
1365	GCAAATAT A CATCATTT	325	AAAUGAUG CUGAUGAG X CGAA AUAUUUGC	2834
1369	ATATACAT C ATTTCCAT	326	AUGGAAAU CUGAUGAG X CGAA AUGUAUAU	2835
1372	TACATCAT T TCCATGGC	327	GCCAUGGA CUGAUGAG X CGAA AUGAUGUA	2836
1373	ACATCATT T CCATGGCT	328	AGCCAUGG CUGAUGAG X CGAA AAUGAUGU	2837
1374	CATCATTT C CATGGCTG	329	CAGCCAUG CUGAUGAG X CGAA AAAUGAUG	2838
1385	TGGCTGCT A GGCTGTGC	330	GCACAGCC CUGAUGAG X CGAA AGCAGCCA	2839
1406	AACTGGAT C CTACGCGG	331	CCGCGUAG CUGAUGAG X CGAA AUCCAGUU	2840
1409	TGGATCCT A CGCGGGAC	332	GUCCCGCG CUGAUGAG X CGAA AGGAUCCA	2841
1420	CGGGACGT C CTTTGTTT	333	AAACAAAG CUGAUGAG X CGAA ACGUCCCG	2842
1423	GACGTCCT T TGTTTACG	334	CGUAAACA CUGAUGAG X CGAA AGGACGUC	2843
1424	ACGTCCTT T GTTTACGT	335	ACGUAAAC CUGAUGAG X CGAA AAGGACGU	2844
1427	TCCTTTGT T TACGTCCC	336	GGGACGUA CUGAUGAG X CGAA ACAAAGGA	2845

Table 37

1428	CCTTTGTT T ACGTCCCG	337	CGGGACGU CUGAUGAG X CGAA AACAAAGG	2846
1429	CTTTGTTT A CGTCCCGT	338	ACGGGACG CUGAUGAG X CGAA AAACAAAG	2847
1433	GTTTACGT C CCGTCGGC	339	GCCGACGG CUGAUGAG X CGAA ACGUAAAC	2848
1438	CGTCCCGT C GGCGCTGA	340	UCAGCGCC CUGAUGAG X CGAA ACGGGACG	2849
1449	CGCTGAAT C CCGCGGAC	341	GUCCGCGG CUGAUGAG X CGAA AUUCAGCG	2850
1465	CGACCCCT C CCGGGGCC	342	GGCCCCGG CUGAUGAG X CGAA AGGGGUCG	2851
1477	GGGCCGCT T GGGGCTCT	343	AGAGCCCC CUGAUGAG X CGAA AGCGGCCC	2852
1484	TTGGGGCT C TACCGCCC	344	GGGCGGUA CUGAUGAG X CGAA AGCCCCAA	2853
1486	GGGGCTCT A CCGCCCGC	345	GCGGGCGG CUGAUGAG X CGAA AGAGCCCC	2854
1496	CGCCCGCT T CTCCGCCT	346	AGGCGGAG CUGAUGAG X CGAA AGCGGGCG	2855
1497	GCCCGCTT C TCCGCCTA	347	UAGGCGGA CUGAUGAG X CGAA AAGCGGGC	2856
1499	CCGCTTCT C CGCCTATT	348	AAUAGGCG CUGAUGAG X CGAA AGAAGCGG	2857
1505	CTCCGCCT A TTGTACCG	349	CGGUACAA CUGAUGAG X CGAA AGGCGGAG	2858
1507	CCGCCTAT T GTACCGAC	350	GUCGGUAC CUGAUGAG X CGAA AUAGGCGG	2859
1510	CCTATTGT A CCGACCGT	351	ACGGUCGG CUGAUGAG X CGAA ACAAUAGG	2860
1519	CCGACCGT C CACGGGGC	352	GCCCCGUG CUGAUGAG X CGAA ACGGUCGG	2861
1534	GCGCACCT C TCTTTACG	353	CGUAAAGA CUGAUGAG X CGAA AGGUGCGC	2862
1536	GCACCTCT C TTTACGCG	354	CGCGUAAA CUGAUGAG X CGAA AGAGGUGC	2863
1538	ACCTCTCT T TACGCGGA	355	UCCGCGUA CUGAUGAG X CGAA AGAGAGGU	2864
1539	CCTCTCTT T ACGCGGAC	356	GUCCGCGU CUGAUGAG X CGAA AAGAGAGG	2865
1540	CTCTCTTT A CGCGGACT	357	AGUCCGCG CUGAUGAG X CGAA AAAGAGAG	2866
1549	CGCGGACT C CCCGTCTG	358	CAGACGGG CUGAUGAG X CGAA AGUCCGCG	2867
1555	CTCCCCGT C TGTGCCTT	359	AAGGCACA CUGAUGAG X CGAA ACGGGGAG	2868
1563	CTGTGCCT T CTCATCTG	360	CAGAUGAG CUGAUGAG X CGAA AGGCACAG	2869
1564	TGTGCCTT C TCATCTGC	361	GCAGAUGA CUGAUGAG X CGAA AAGGCACA	2870
1566	TGCCTTCT C ATCTGCCG	362	CGGCAGAU CUGAUGAG X CGAA AGAAGGCA	2871
1569	CTTCTCAT C TGCCGGAC	363	GUCCGGCA CUGAUGAG X CGAA AUGAGAAG	2872
1588	TGTGCACT T CGCTTCAC	364	GUGAAGCG CUGAUGAG X CGAA AGUGCACA	2873
1589	GTGCACTT C GCTTCACC	365	GGUGAAGC CUGAUGAG X CGAA AAGUGCAC	2874
1593	ACTTCGCT T CACCTCTG	366	CAGAGGUG CUGAUGAG X CGAA AGCGAAGU	2875
1594	CTTCGCTT C ACCTCTGC	367	GCAGAGGU CUGAUGAG X CGAA AAGCGAAG	2876
1599	CTTCACCT C TGCACGTC	368	GACGUGCA CUGAUGAG X CGAA AGGUGAAG	2877
1607	CTGCACGT C GCATGGAG	369	CUCCAUGC CUGAUGAG X CGAA ACGUGCAG	2878
1651	CCCAAGGT C TTGCATAA	370	UUAUGCAA CUGAUGAG X CGAA ACCUUGGG	2879
1653	CAAGGTCT T GCATAAGA	371	UCUUAUGC CUGAUGAG X CGAA AGACCUUG	2880
1658	TCTTGCAT A AGAGGACT	372	AGUCCUCU CUGAUGAG X CGAA AUGCAAGA	2881
1667	AGAGGACT C TTGGACTT	373	AAGUCCAA CUGAUGAG X CGAA AGUCCUCU	2882
1669	AGGACTCT T GGACTTTC	374	GAAAGUCC CUGAUGAG X CGAA AGAGUCCU	2883
1675	CTTGGACT T TCAGCAAT	375	AUUGCUGA CUGAUGAG X CGAA AGUCCAAG	2884
1676	TTGGACTT T CAGCAATG	376	CAUUGCUG CUGAUGAG X CGAA AAGUCCAA	2885
1677	TGGACTTT C AGCAATGT	377	ACAUUGCU CUGAUGAG X CGAA AAAGUCCA	2886
1686	AGCAATGT C AACGACCG	378	CGGUCGUU CUGAUGAG X CGAA ACAUUGCU	2887
1699	ACCGACCT T GAGGCATA	379	UAUGCCUC CUGAUGAG X CGAA AGGUCGGU	2888
1707	TGAGGCAT A CTTCAAAG	380	CUUUGAAG CUGAUGAG X CGAA AUGCCUCA	2889
1710	GGCATACT T CAAAGACT	381	AGUCUUUG CUGAUGAG X CGAA AGUAUGCC	2890
1711	GCATACTT C AAAGACTG	382	CAGUCUUU CUGAUGAG X CGAA AAGUAUGC	2891
1725	CTGTGTGT T TAATGAGT	383	ACUCAUUA CUGAUGAG X CGAA ACACACAG	2892
1726	TGTGTGTT T AATGAGTG	384	CACUCAUU CUGAUGAG X CGAA AACACACA	2893
1727	GTGTGTTT A ATGAGTGG	385	CCACUCAU CUGAUGAG X CGAA AAACACAC	2894
1743	GGAGGAGT T GGGGGAGG	386	CCUCCCCC CUGAUGAG X CGAA ACUCCUCC	2895
1756	GAGGAGGT T AGGTTAAA	387	UUUAACCU CUGAUGAG X CGAA ACCUCCUC	2896

Table 37

1757	AGGAGGTT A GGTTAAAG	388	CUUUAACC CUGAUGAG X CGAA AACCUCCU	2897
1761	GGTTAGGT T AAAGGTCT	389	AGACCUUU CUGAUGAG X CGAA ACCUAACC	2898
1762	GTTAGGTT A AAGGTCTT	390	AAGACCUU CUGAUGAG X CGAA AACCUAAC	2899
1768	TTAAAGGT C TTTGTACT	391	AGUACAAA CUGAUGAG X CGAA ACCUUUAA	2900
1770	AAAGGTCT T TGTACTAG	392	CUAGUACA CUGAUGAG X CGAA AGACCUUU	2901
1771	AAGGTCTT T GTACTAGG	393	CCUAGUAC CUGAUGAG X CGAA AAGACCUU	2902
1774	GTCTTTGT A CTAGGAGG	394	CCUCCUAG CUGAUGAG X CGAA ACAAAGAC	2903
1777	TTTGTACT A GGAGGCTG	395	CAGCCUCC CUGAUGAG X CGAA AGUACAAA	2904
1787	GAGGCTGT A GGCATAAA	396	UUUAUGCC CUGAUGAG X CGAA ACAGCCUC	2905
1793	GTAGGCAT A AATTGGTG	397	CACCAAUU CUGAUGAG X CGAA AUGCCUAC	2906
1797	GCATAAAT T GGTGTGTT	398	AACACACC CUGAUGAG X CGAA AUUUAUGC	2907
1805	TGGTGTGT T CACCAGCA	399	UGCUGGUG CUGAUGAG X CGAA ACACACCA	2908
1806	GGTGTGTT C ACCAGCAC	400	GUGCUGGU CUGAUGAG X CGAA AACACACC	2909
1824	ATGCAACT T TTTCACCT	401	AGGUGAAA CUGAUGAG X CGAA AGUUGCAU	2910
1825	TGCAACTT T TTCACCTC	402	GAGGUGAA CUGAUGAG X CGAA AAGUUGCA	2911
1826	GCAACTTT T TCACCTCT	403	AGAGGUGA CUGAUGAG X CGAA AAAGUUGC	2912
1827	CAACTTTT T CACCTCTG	404	CAGAGGUG CUGAUGAG X CGAA AAAAGUUG	2913
1828	AACTTTTT C ACCTCTGC	405	GCAGAGGU CUGAUGAG X CGAA AAAAAGUU	2914
1833	TTTCACCT C TGCCTAAT	406	AUUAGGCA CUGAUGAG X CGAA AGGUGAAA	2915
1839	CTCTGCCT A ATCATCTC	407	GAGAUGAU CUGAUGAG X CGAA AGGCAGAG	2916
1842	TGCCTAAT C ATCTCATG	408	CAUGAGAU CUGAUGAG X CGAA AUUAGGCA	2917
1845	CTAATCAT C TCATGTTC	409	GAACAUGA CUGAUGAG X CGAA AUGAUUAG	2918
1847	AATCATCT C ATGTTCAT	410	AUGAACAU CUGAUGAG X CGAA AGAUGAUU	2919
1852	TCTCATGT T CATGTCCT	411	AGGACAUG CUGAUGAG X CGAA ACAUGAGA	2920
1853	CTCATGTT C ATGTCCTA	412	UAGGACAU CUGAUGAG X CGAA AACAUGAG	2921
1858	GTTCATGT C CTACTGTT	413	AACAGUAG CUGAUGAG X CGAA ACAUGAAC	2922
1861	CATGTCCT A CTGTTCAA	414	UUGAACAG CUGAUGAG X CGAA AGGACAUG	2923
1866	CCTACTGT T CAAGCCTC	415	GAGGCUUG CUGAUGAG X CGAA ACAGUAGG	2924
1867	CTACTGTT C AAGCCTCC	416	GGAGGCUU CUGAUGAG X CGAA AACAGUAG	2925
1874	TCAAGCCT C CAAGCTGT	417	ACAGCUUG CUGAUGAG X CGAA AGGCUUGA	2926
1887	CTGTGCCT T GGGTGGCT	418	AGCCACCC CUGAUGAG X CGAA AGGCACAG	2927
1896	GGGTGGCT T TGGGGCAT	419	AUGCCCCA CUGAUGAG X CGAA AGCCACCC	2928
1897	GGTGGCTT T GGGGCATG	420	CAUGCCCC CUGAUGAG X CGAA AAGCCACC	2929
1911	ATGGACAT T GACCCGTA	421	UACGGGUC CUGAUGAG X CGAA AUGUCCAU	2930
1919	TGACCCGT A TAAAGAAT	422	AUUCUUUA CUGAUGAG X CGAA ACGGGUCA	2931
1921	ACCCGTAT A AAGAATTT	423	AAAUUCUU CUGAUGAG X CGAA AUACGGGU	2932
1928	TAAAGAAT T TGGAGCTT	424	AAGCUCCA CUGAUGAG X CGAA AUUCUUUA	2933
1929	AAAGAATT T GGAGCTTC	425	GAAGCUCC CUGAUGAG X CGAA AAUUCUUU	2934
1936	TTGGAGCT T CTGTGGAG	426	CUCCACAG CUGAUGAG X CGAA AGCUCCAA	2935
1937	TGGAGCTT C TGTGGAGT	427	ACUCCACA CUGAUGAG X CGAA AAGCUCCA	2936
1946	TGTGGAGT T ACTCTCTT	428	AAGAGAGU CUGAUGAG X CGAA ACUCCACA	2937
1947	GTGGAGTT A CTCTCTTT	429	AAAGAGAG CUGAUGAG X CGAA AACUCCAC	2938
1950	GAGTTACT C TCTTTTTT	430	AAAAAAGA CUGAUGAG X CGAA AGUAACUC	2939
1952	GTTACTCT C TTTTTTGC	431	GCAAAAAA CUGAUGAG X CGAA AGAGUAAC	2940
1954	TACTCTCT T TTTTGCCT	432	AGGCAAAA CUGAUGAG X CGAA AGAGAGUA	2941
1955	ACTCTCTT T TTTGCCTT	433	AAGGCAAA CUGAUGAG X CGAA AAGAGAGU	2942
1956	CTCTCTTT T TTGCCTTC	434	GAAGGCAA CUGAUGAG X CGAA AAAGAGAG	2943
1957	TCTCTTTT T TGCCTTCT	435	AGAAGGCA CUGAUGAG X CGAA AAAAGAGA	2944
1958	CTCTTTTT T GCCTTCTG	436	CAGAAGGC CUGAUGAG X CGAA AAAAAGAG	2945
1963	TTTTGCCT T CTGACTTC	437	GAAGUCAG CUGAUGAG X CGAA AGGCAAAA	2946
1964	TTTGCCTT C TGACTTCT	438	AGAAGUCA CUGAUGAG X CGAA AAGGCAAA	2947

Table 37

1970	TTCTGACT T CTTTCCTT	439	AAGGAAAG CUGAUGAG X CGAA AGUCAGAA	2948
1971	TCTGACTT C TTTCCTTC	440	GAAGGAAA CUGAUGAG X CGAA AAGUCAGA	2949
1973	TGACTTCT T TCCTTCTA	441	UAGAAGGA CUGAUGAG X CGAA AGAAGUCA	2950
1974	GACTTCTT T CCTTCTAT	442	AUAGAAGG CUGAUGAG X CGAA AAGAAGUC	2951
1975	ACTTCTTT C CTTCTATT	443	AAUAGAAG CUGAUGAG X CGAA AAAGAAGU	2952
1978	TCTTTCCT T CTATTCGA	444	UCGAAUAG CUGAUGAG X CGAA AGGAAAGA	2953
1979	CTTTCCTT C TATTCGAG	445	CUCGAAUA CUGAUGAG X CGAA AAGGAAAG	2954
1981	TTCCTTCT A TTCGAGAT	446	AUCUCGAA CUGAUGAG X CGAA AGAAGGAA	2955
1983	CCTTCTAT T CGAGATCT	447	AGAUCUCG CUGAUGAG X CGAA AUAGAAGG	2956
1984	CTTCTATT C GAGATCTC	448	GAGAUCUC CUGAUGAG X CGAA AAUAGAAG	2957
1990	TTCGAGAT C TCCTCGAC	449	GUCGAGGA CUGAUGAG X CGAA AUCUCGAA	2958
1992	CGAGATCT C CTCGACAC	450	GUGUCGAG CUGAUGAG X CGAA AGAUCUCG	2959
1995	GATCTCCT C GACACCGC	451	GCGGUGUC CUGAUGAG X CGAA AGGAGAUC	2960
2006	CACCGCCT C TGCTCTGT	452	ACAGAGCA CUGAUGAG X CGAA AGGCGGUG	2961
2011	CCTCTGCT C TGTATCGG	453	CCGAUACA CUGAUGAG X CGAA AGCAGAGG	2962
2015	TGCTCTGT A TCGGGGGG	454	CCCCCCGA CUGAUGAG X CGAA ACAGAGCA	2963
2017	CTCTGTAT C GGGGGGCC	455	GGCCCCCC CUGAUGAG X CGAA AUACAGAG	2964
2027	GGGGGCCT T AGAGTCTC	456	GAGACUCU CUGAUGAG X CGAA AGGCCCCC	2965
2028	GGGGCCTT A GAGTCTCC	457	GGAGACUC CUGAUGAG X CGAA AAGGCCCC	2966
2033	CTTAGAGT C TCCGGAAC	458	GUUCCGGA CUGAUGAG X CGAA ACUCUAAG	2967
2035	TAGAGTCT C CGGAACAT	459	AUGUUCCG CUGAUGAG X CGAA AGACUCUA	2968
2044	CGGAACAT T GTTCACCT	460	AGGUGAAC CUGAUGAG X CGAA AUGUUCCG	2969
2047	AACATTGT T CACCTCAC	461	GUGAGGUG CUGAUGAG X CGAA ACAAUGUU	2970
2048	ACATTGTT C ACCTCACC	462	GGUGAGGU CUGAUGAG X CGAA AACAAUGU	2971
2053	GTTCACCT C ACCATACG	463	CGUAUGGU CUGAUGAG X CGAA AGGUGAAC	2972
2059	CTCACCAT A CGGCACTC	464	GAGUGCCG CUGAUGAG X CGAA AUGGUGAG	2973
2067	ACGGCACT C AGGCAAGC	465	GCUUGCCU CUGAUGAG X CGAA AGUGCCGU	2974
2077	GGCAAGCT A TTCTGTGT	466	ACACAGAA CUGAUGAG X CGAA AGCUUGCC	2975
2079	CAAGCTAT T CTGTGTTG	467	CAACACAG CUGAUGAG X CGAA AUAGCUUG	2976
2080	AAGCTATT C TGTGTTGG	468	CCAACACA CUGAUGAG X CGAA AAUAGCUU	2977
2086	TTCTGTGT T GGGGTGAG	469	CUCACCCC CUGAUGAG X CGAA ACACAGAA	2978
2096	GGGTGAGT T GATGAATC	470	GAUUCAUC CUGAUGAG X CGAA ACUCACCC	2979
2104	TGATGAAT C TAGCCACC	471	GGUGGCUA CUGAUGAG X CGAA AUUCAUCA	2980
2106	ATGAATCT A GCCACCTG	472	CAGGUGGC CUGAUGAG X CGAA AGAUUCAU	2981
2125	TGGGAAGT A ATTTGGAA	473	UUCCAAAU CUGAUGAG X CGAA ACUUCCCA	2982
2128	GAAGTAAT T TGGAAGAT	474	AUCUUCCA CUGAUGAG X CGAA AUUACUUC	2983
2129	AAGTAATT T GGAAGATC	475	GAUCUUCC CUGAUGAG X CGAA AAUUACUU	2984
2137	TGGAAGAT C CAGCATCC	476	GGAUGCUG CUGAUGAG X CGAA AUCUUCCA	2985
2144	TCCAGCAT C CAGGGAAT	477	AUUCCCUG CUGAUGAG X CGAA AUGCUGGA	2986
2153	CAGGGAAT T AGTAGTCA	478	UGACUACU CUGAUGAG X CGAA AUUCCCUG	2987
2154	AGGGAATT A GTAGTCAG	479	CUGACUAC CUGAUGAG X CGAA AAUUCCCU	2988
2157	GAATTAGT A GTCAGCTA	480	UAGCUGAC CUGAUGAG X CGAA ACUAAUUC	2989
2160	TTAGTAGT C AGCTATGT	481	ACAUAGCU CUGAUGAG X CGAA ACUACUAA	2990
2165	AGTCAGCT A TGTCAACG	482	CGUUGACA CUGAUGAG X CGAA AGCUGACU	2991
2169	AGCTATGT C AACGTTAA	483	UUAACGUU CUGAUGAG X CGAA ACAUAGCU	2992
2175	GTCAACGT T AATATGGG	484	CCCAUAUU CUGAUGAG X CGAA ACGUUGAC	2993
2176	TCAACGTT A ATATGGGC	485	GCCCAUAU CUGAUGAG X CGAA AACGUUGA	2994
2179	ACGTTAAT A TGGGCCTA	486	UAGGCCCA CUGAUGAG X CGAA AUUAACGU	2995
2187	ATGGGCCT A AAAATCAG	487	CUGAUUUU CUGAUGAG X CGAA AGGCCCAU	2996
2193	CTAAAAAT C AGACAACT	488	AGUUGUCU CUGAUGAG X CGAA AUUUUUAG	2997
2202	AGACAACT A TTGTGGTT	489	AACCACAA CUGAUGAG X CGAA AGUUGUCU	2998

Table 37

2204	ACAACTAT T GTGGTTTC	490	GAAACCAC CUGAUGAG X CGAA AUAGUUGU	2999
2210	ATTGTGGT T TCACATTT	491	AAAUGUGA CUGAUGAG X CGAA ACCACAAU	3000
2211	TTGTGGTT T CACATTTC	492	GAAAUGUG CUGAUGAG X CGAA AACCACAA	3001
2212	TGTGGTTT C ACATTTCC	493	GGAAAUGU CUGAUGAG X CGAA AAACCACA	3002
2217	TTTCACAT T TCCTGTCT	494	AGACAGGA CUGAUGAG X CGAA AUGUGAAA	3003
2218	TTCACATT T CCTGTCTT	495	AAGACAGG CUGAUGAG X CGAA AAUGUGAA	3004
2219	TCACATTT C CTGTCTTA	496	UAAGACAG CUGAUGAG X CGAA AAAUGUGA	3005
2224	TTTCCTGT C TTACTTTT	497	AAAAGUAA CUGAUGAG X CGAA ACAGGAAA	3006
2226	TCCTGTCT T ACTTTTGG	498	CCAAAAGU CUGAUGAG X CGAA AGACAGGA	3007
2227	CCTGTCTT A CTTTTGGG	499	CCCAAAAG CUGAUGAG X CGAA AAGACAGG	3008
2230	GTCTTACT T TTGGGCGA	500	UCGCCCAA CUGAUGAG X CGAA AGUAAGAC	3009
2231	TCTTACTT T TGGGCGAG	501	CUCGCCCA CUGAUGAG X CGAA AAGUAAGA	3010
2232	CTTACTTT T GGGCGAGA	502	UCUCGCCC CUGAUGAG X CGAA AAAGUAAG	3011
2247	GAAACTGT T CTTGAATA	503	UAUUCAAG CUGAUGAG X CGAA ACAGUUUC	3012
2248	AAACTGTT C TTGAATAT	504	AUAUUCAA CUGAUGAG X CGAA AACAGUUU	3013
2250	ACTGTTCT T GAATATTT	505	AAAUAUUC CUGAUGAG X CGAA AGAACAGU	3014
2255	TCTTGAAT A TTTGGTGT	506	ACACCAAA CUGAUGAG X CGAA AUUCAAGA	3015
2257	TTGAATAT T TGGTGTCT	507	AGACACCA CUGAUGAG X CGAA AUAUUCAA	3016
2258	TGAATATT T GGTGTCTT	508	AAGACACC CUGAUGAG X CGAA AAUAUUCA	3017
2264	TTTGGTGT C TTTTGGAG	509	CUCCAAAA CUGAUGAG X CGAA ACACCAAA	3018
2266	TGGTGTCT T TTGGAGTG	510	CACUCCAA CUGAUGAG X CGAA AGACACCA	3019
2267	GGTGTCTT T TGGAGTGT	511	ACACUCCA CUGAUGAG X CGAA AAGACACC	3020
2268	GTGTCTTT T GGAGTGTG	512	CACACUCC CUGAUGAG X CGAA AAAGACAC	3021
2280	GTGTGGAT T CGCACTCC	513	GGAGUGCG CUGAUGAG X CGAA AUCCACAC	3022
2281	TGTGGATT C GCACTCCT	514	AGGAGUGC CUGAUGAG X CGAA AAUCCACA	3023
2287	TTCGCACT C CTCCTGCA	515	UGCAGGAG CUGAUGAG X CGAA AGUGCGAA	3024
2290	GCACTCCT C CTGCATAT	516	AUAUGCAG CUGAUGAG X CGAA AGGAGUGC	3025
2297	TCCTGCAT A TAGACCAC	517	GUGGUCUA CUGAUGAG X CGAA AUGCAGGA	3026
2299	CTGCATAT A GACCACCA	518	UGGUGGUC CUGAUGAG X CGAA AUAUGCAG	3027
2317	ATGCCCCT A TCTTATCA	519	UGAUAAGA CUGAUGAG X CGAA AGGGGCAU	3028
2319	GCCCCTAT C TTATCAAC	520	GUUGAUAA CUGAUGAG X CGAA AUAGGGGC	3029
2321	CCCTATCT T ATCAACAC	521	GUGUUGAU CUGAUGAG X CGAA AGAUAGGG	3030
2322	CCTATCTT A TCAACACT	522	AGUGUUGA CUGAUGAG X CGAA AAGAUAGG	3031
2324	TATCTTAT C AACACTTC	523	GAAGUGUU CUGAUGAG X CGAA AUAAGAUA	3032
2331	TCAACACT T CCGGAAAC	524	GUUUCCGG CUGAUGAG X CGAA AGUGUUGA	3033
2332	CAACACTT C CGGAAACT	525	AGUUUCCG CUGAUGAG X CGAA AAGUGUUG	3034
2341	CGGAAACT A CTGTTGTT	526	AACAACAG CUGAUGAG X CGAA AGUUUCCG	3035
2346	ACTACTGT T GTTAGACG	527	CGUCUAAC CUGAUGAG X CGAA ACAGUAGU	3036
2349	ACTGTTGT T AGACGAAG	528	CUUCGUCU CUGAUGAG X CGAA ACAACAGU	3037
2350	CTGTTGTT A GACGAAGA	529	UCUUCGUC CUGAUGAG X CGAA AACAACAG	3038
2366	AGGCAGGT C CCCTAGAA	530	UUCUAGGG CUGAUGAG X CGAA ACCUGCCU	3039
2371	GGTCCCCT A GAAGAAGA	531	UCUUCUUC CUGAUGAG X CGAA AGGGGACC	3040
2383	GAAGAACT C CCTCGCCT	532	AGGCGAGG CUGAUGAG X CGAA AGUUCUUC	3041
2387	AACTCCCT C GCCTCGCA	533	UGCGAGGC CUGAUGAG X CGAA AGGGAGUU	3042
2392	CCTCGCCT C GCAGACGA	534	UCGUCUGC CUGAUGAG X CGAA AGGCGAGG	3043
2405	ACGAAGGT C TCAATCGC	535	GCGAUUGA CUGAUGAG X CGAA ACCUUCGU	3044
2407	GAAGGTCT C AATCGCCG	536	CGGCGAUU CUGAUGAG X CGAA AGACCUUC	3045
2411	GTCTCAAT C GCCGCGTC	537	GACGCGGC CUGAUGAG X CGAA AUUGAGAC	3046
2419	CGCCGCGT C GCAGAAGA	538	UCUUCUGC CUGAUGAG X CGAA ACGCGGCG	3047
2429	CAGAAGAT C TCAATCTC	539	GAGAUUGA CUGAUGAG X CGAA AUCUUCUG	3048
2431	GAAGATCT C AATCTCGG	540	CCGAGAUU CUGAUGAG X CGAA AGAUCUUC	3049

Table 37

2435	ATCTCAAT C TCGGGAAT	541	AUUCCCGA CUGAUGAG X CGAA AUUGAGAU	3050
2437	CTCAATCT C GGGAATCT	542	AGAUUCCC CUGAUGAG X CGAA AGAUUGAG	3051
2444	TCGGGAAT C TCAATGTT	543	AACAUUGA CUGAUGAG X CGAA AUUCCCGA	3052
2446	GGGAATCT C AATGTTAG	544	CUAACAUU CUGAUGAG X CGAA AGAUUCCC	3053
2452	CTCAATGT T AGTATTCC	545	GGAAUACU CUGAUGAG X CGAA ACAUUGAG	3054
2453	TCAATGTT A GTATTCCT	546	AGGAAUAC CUGAUGAG X CGAA AACAUUGA	3055
2456	ATGTTAGT A TTCCTTGG	547	CCAAGGAA CUGAUGAG X CGAA ACUAACAU	3056
2458	GTTAGTAT T CCTTGGAC	548	GUCCAAGG CUGAUGAG X CGAA AUACUAAC	3057
2459	TTAGTATT C CTTGGACA	549	UGUCCAAG CUGAUGAG X CGAA AAUACUAA	3058
2462	GTATTCCT T GGACACAT	550	AUGUGUCC CUGAUGAG X CGAA AGGAAUAC	3059
2471	GGACACAT A AGGTGGGA	551	UCCCACCU CUGAUGAG X CGAA AUGUGUCC	3060
2484	GGGAAACT T TACGGGGC	552	GCCCCGUA CUGAUGAG X CGAA AGUUUCCC	3061
2485	GGAAACTT T ACGGGGCT	553	AGCCCCGU CUGAUGAG X CGAA AAGUUUCC	3062
2486	GAAACTTT A CGGGGCTT	554	AAGCCCCG CUGAUGAG X CGAA AAAGUUUC	3063
2494	ACGGGGCT T TATTCTTC	555	GAAGAAUA CUGAUGAG X CGAA AGCCCCGU	3064
2495	CGGGGCTT T ATTCTTCT	556	AGAAGAAU CUGAUGAG X CGAA AAGCCCCG	3065
2496	GGGGCTTT A TTCTTCTA	557	UAGAAGAA CUGAUGAG X CGAA AAAGCCCC	3066
2498	GGCTTTAT T CTTCTACG	558	CGUAGAAG CUGAUGAG X CGAA AUAAAGCC	3067
2499	GCTTTATT C TTCTACGG	559	CCGUAGAA CUGAUGAG X CGAA AAUAAAGC	3068
2501	TTTATTCT T CTACGGTA	560	UACCGUAG CUGAUGAG X CGAA AGAAUAAA	3069
2502	TTATTCTT C TACGGTAC	561	GUACCGUA CUGAUGAG X CGAA AAGAAUAA	3070
2504	ATTCTTCT A CGGTACCT	562	AGGUACCG CUGAUGAG X CGAA AGAAGAAU	3071
2509	TCTACGGT A CCTTGCTT	563	AAGCAAGG CUGAUGAG X CGAA ACCGUAGA	3072
2513	CGGTACCT T GCTTTAAT	564	AUUAAAGC CUGAUGAG X CGAA AGGUACCG	3073
2517	ACCTTGCT T TAATCCTA	565	UAGGAUUA CUGAUGAG X CGAA AGCAAGGU	3074
2518	CCTTGCTT T AATCCTAA	566	UUAGGAUU CUGAUGAG X CGAA AAGCAAGG	3075
2519	CTTGCTTT A ATCCTAAA	567	UUUAGGAU CUGAUGAG X CGAA AAAGCAAG	3076
2522	GCTTTAAT C CTAAATGG	568	CCAUUUAG CUGAUGAG X CGAA AUUAAAGC	3077
2525	TTAATCCT A AATGGCAA	569	UUGCCAUU CUGAUGAG X CGAA AGGAUUAA	3078
2537	GGCAAACT C CTTCTTTT	570	AAAAGAAG CUGAUGAG X CGAA AGUUUGCC	3079
2540	AAACTCCT T CTTTTCCT	571	AGGAAAAG CUGAUGAG X CGAA AGGAGUUU	3080
2541	AACTCCTT C TTTTCCTG	572	CAGGAAAA CUGAUGAG X CGAA AAGGAGUU	3081
2543	CTCCTTCT T TTCCTGAC	573	GUCAGGAA CUGAUGAG X CGAA AGAAGGAG	3082
2544	TCCTTCTT T TCCTGACA	574	UGUCAGGA CUGAUGAG X CGAA AAGAAGGA	3083
2545	CCTTCTTT T CCTGACAT	575	AUGUCAGG CUGAUGAG X CGAA AAAGAAGG	3084
2546	CTTCTTTT C CTGACATT	576	AAUGUCAG CUGAUGAG X CGAA AAAAGAAG	3085
2554	CCTGACAT T CATTTGCA	577	UGCAAAUG CUGAUGAG X CGAA AUGUCAGG	3086
2555	CTGACATT C ATTTGCAG	578	CUGCAAAU CUGAUGAG X CGAA AAUGUCAG	3087
2558	ACATTCAT T TGCAGGAG	579	CUCCUGCA CUGAUGAG X CGAA AUGAAUGU	3088
2559	CATTCATT T GCAGGAGG	580	CCUCCUGC CUGAUGAG X CGAA AAUGAAUG	3089
2572	GAGGACAT T GTTGATAG	581	CUAUCAAC CUGAUGAG X CGAA AUGUCCUC	3090
2575	GACATTGT T GATAGATG	582	CAUCUAUC CUGAUGAG X CGAA ACAAUGUC	3091
2579	TTGTTGAT A GATGTAAG	583	CUUACAUC CUGAUGAG X CGAA AUCAACAA	3092
2585	ATAGATGT A AGCAATTT	584	AAAUUGCU CUGAUGAG X CGAA ACAUCUAU	3093
2592	TAAGCAAT T TGTGGGGC	585	GCCCCACA CUGAUGAG X CGAA AUUGCUUA	3094
2593	AAGCAATT T GTGGGGCC	586	GGCCCCAC CUGAUGAG X CGAA AAUUGCUU	3095
2605	GGGCCCCT T ACAGTAAA	587	UUUACUGU CUGAUGAG X CGAA AGGGGCCC	3096
2606	GGCCCCTT A CAGTAAAT	588	AUUUACUG CUGAUGAG X CGAA AAGGGGCC	3097
2611	CTTACAGT A AATGAAAA	589	UUUUCAUU CUGAUGAG X CGAA ACUGUAAG	3098
2629	AGGAGACT T AAATTAAC	590	GUUAAUUU CUGAUGAG X CGAA AGUCUCCU	3099
2630	GGAGACTT A AATTAACT	591	AGUUAAUU CUGAUGAG X CGAA AAGUCUCC	3100

Table 37

2634	ACTTAAAT T AACTATGC	592	GCAUAGUU CUGAUGAG X CGAA AUUUAAGU	3101
2635	CTTAAATT A ACTATGCC	593	GGCAUAGU CUGAUGAG X CGAA AAUUUAAG	3102
2639	AATTAACT A TGCCTGCT	594	AGCAGGCA CUGAUGAG X CGAA AGUUAAUU	3103
2648	TGCCTGCT A GGTTTTAT	595	AUAAAACC CUGAUGAG X CGAA AGCAGGCA	3104
2652	TGCTAGGT T TTATCCCA	596	UGGGAUAA CUGAUGAG X CGAA ACCUAGCA	3105
2653	GCTAGGTT T TATCCCAA	597	UUGGGAUA CUGAUGAG X CGAA AACCUAGC	3106
2654	CTAGGTTT T ATCCCAAT	598	AUUGGGAU CUGAUGAG X CGAA AAACCUAG	3107
2655	TAGGTTTT A TCCCAATG	599	CAUUGGGA CUGAUGAG X CGAA AAAACCUA	3108
2657	GGTTTTAT C CCAATGTT	600	AACAUUGG CUGAUGAG X CGAA AUAAAACC	3109
2665	CCCAATGT T ACTAAATA	601	UAUUUAGU CUGAUGAG X CGAA ACAUUGGG	3110
2666	CCAATGTT A CTAAATAT	602	AUAUUUAG CUGAUGAG X CGAA AACAUUGG	3111
2669	ATGTTACT A AATATTTG	603	CAAAUAUU CUGAUGAG X CGAA AGUAACAU	3112
2673	TACTAAAT A TTTGCCCT	604	AGGGCAAA CUGAUGAG X CGAA AUUUAGUA	3113
2675	CTAAATAT T TGCCCTTA	605	UAAGGGCA CUGAUGAG X CGAA AUAUUUAG	3114
2676	TAAATATT T GCCCTTAG	606	CUAAGGGC CUGAUGAG X CGAA AAUAUUUA	3115
2682	TTTGCCCT T AGATAAAG	607	CUUUAUCU CUGAUGAG X CGAA AGGGCAAA	3116
2683	TTGCCCTT A GATAAAGG	608	CCUUUAUC CUGAUGAG X CGAA AAGGGCAA	3117
2687	CCTTAGAT A AAGGGATC	609	GAUCCCUU CUGAUGAG X CGAA AUCUAAGG	3118
2695	AAAGGGAT C AAACCGTA	610	UACGGUUU CUGAUGAG X CGAA AUCCCUUU	3119
2703	CAAACCGT A TTATCCAG	611	CUGGAUAA CUGAUGAG X CGAA ACGGUUUG	3120
2705	AACCGTAT T ATCCAGAG	612	CUCUGGAU CUGAUGAG X CGAA AUACGGUU	3121
2706	ACCGTATT A TCCAGAGT	613	ACUCUGGA CUGAUGAG X CGAA AAUACGGU	3122
2708	CGTATTAT C CAGAGTAT	614	AUACUCUG CUGAUGAG X CGAA AUAAUACG	3123
2715	TCCAGAGT A TGTAGTTA	615	UAACUACA CUGAUGAG X CGAA ACUCUGGA	3124
2719	GAGTATGT A GTTAATCA	616	UGAUUAAC CUGAUGAG X CGAA ACAUACUC	3125
2722	TATGTAGT T AATCATTA	617	UAAUGAUU CUGAUGAG X CGAA ACUACAUA	3126
2723	ATGTAGTT A ATCATTAC	618	GUAAUGAU CUGAUGAG X CGAA AACUACAU	3127
2726	TAGTTAAT C ATTACTTC	619	GAAGUAAU CUGAUGAG X CGAA AUUAACUA	3128
2729	TTAATCAT T ACTTCCAG	620	CUGGAAGU CUGAUGAG X CGAA AUGAUUAA	3129
2730	TAATCATT A CTTCCAGA	621	UCUGGAAG CUGAUGAG X CGAA AAUGAUUA	3130
2733	TCATTACT T CCAGACGC	622	GCGUCUGG CUGAUGAG X CGAA AGUAAUGA	3131
2734	CATTACTT C CAGACGCG	623	CGCGUCUG CUGAUGAG X CGAA AAGUAAUG	3132
2747	CGCGACAT T ATTTACAC	624	GUGUAAAU CUGAUGAG X CGAA AUGUCGCG	3133
2748	GCGACATT A TTTACACA	625	UGUGUAAA CUGAUGAG X CGAA AAUGUCGC	3134
2750	GACATTAT T TACACACT	626	AGUGUGUA CUGAUGAG X CGAA AUAAUGUC	3135
2751	ACATTATT T ACACACTC	627	GAGUGUGU CUGAUGAG X CGAA AAUAAUGU	3136
2752	CATTATTT A CACACTCT	628	AGAGUGUG CUGAUGAG X CGAA AAAUAAUG	3137
2759	TACACACT C TTTGGAAG	629	CUUCCAAA CUGAUGAG X CGAA AGUGUGUA	3138
2761	CACACTCT T TGGAAGGC	630	GCCUUCCA CUGAUGAG X CGAA AGAGUGUG	3139
2762	ACACTCTT T GGAAGGCG	631	CGCCUUCC CUGAUGAG X CGAA AAGAGUGU	3140
2776	GCGGGGAT C TTATATAA	632	UUAUAUAA CUGAUGAG X CGAA AUCCCCGC	3141
2778	GGGGATCT T ATATAAAA	633	UUUUAUAU CUGAUGAG X CGAA AGAUCCCC	3142
2779	GGGATCTT A TATAAAAG	634	CUUUUAUA CUGAUGAG X CGAA AAGAUCCC	3143
2781	GATCTTAT A TAAAAGAG	635	CUCUUUUA CUGAUGAG X CGAA AUAAGAUC	3144
2783	TCTTATAT A AAAGAGAG	636	CUCUCUUU CUGAUGAG X CGAA AUAUAAGA	3145
2793	AAGAGAGT C CACACGTA	637	UACGUGUG CUGAUGAG X CGAA ACUCUCUU	3146
2801	CCACACGT A GCGCCTCA	638	UGAGGCGC CUGAUGAG X CGAA ACGUGUGG	3147
2808	TAGCGCCT C ATTTTGCG	639	CGCAAAAU CUGAUGAG X CGAA AGGCGCUA	3148
2811	CGCCTCAT T TTGCGGGT	640	ACCCGCAA CUGAUGAG X CGAA AUGAGGCG	3149
2812	GCCTCATT T TGCGGGTC	641	GACCCGCA CUGAUGAG X CGAA AAUGAGGC	3150
2813	CCTCATTT T GCGGGTCA	642	UGACCCGC CUGAUGAG X CGAA AAAUGAGG	3151

Table 37

2820	TTGCGGGT C ACCATATT	643	AAUAUGGU CUGAUGAG X CGAA ACCCGCAA	3152
2826	GTCACCAT A TTCTTGGG	644	CCCAAGAA CUGAUGAG X CGAA AUGGUGAC	3153
2828	CACCATAT T CTTGGGAA	645	UUCCCAAG CUGAUGAG X CGAA AUAUGGUG	3154
2829	ACCATATT C TTGGGAAC	646	GUUCCCAA CUGAUGAG X CGAA AAUAUGGU	3155
2831	CATATTCT T GGGAACAA	647	UUGUUCCC CUGAUGAG X CGAA AGAAUAUG	3156
2843	AACAAGAT C TACAGCAT	648	AUGCUGUA CUGAUGAG X CGAA AUCUUGUU	3157
2845	CAAGATCT A CAGCATGG	649	CCAUGCUG CUGAUGAG X CGAA AGAUCUUG	3158
2859	TGGGAGGT T GGTCTTCC	650	GGAAGACC CUGAUGAG X CGAA ACCUCCCA	3159
2863	AGGTTGGT C TTCCAAAC	651	GUUUGGAA CUGAUGAG X CGAA ACCAACCU	3160
2865	GTTGGTCT T CCAAACCT	652	AGGUUUGG CUGAUGAG X CGAA AGACCAAC	3161
2866	TTGGTCTT C CAAACCTC	653	GAGGUUUG CUGAUGAG X CGAA AAGACCAA	3162
2874	CCAAACCT C GAAAAGGC	654	GCCUUUUC CUGAUGAG X CGAA AGGUUUGG	3163
2895	GGACAAAT C TTTCTGTC	655	GACAGAAA CUGAUGAG X CGAA AUUUGUCC	3164
2897	ACAAATCT T TCTGTCCC	656	GGGACAGA CUGAUGAG X CGAA AGAUUUGU	3165
2898	CAAATCTT T CTGTCCCC	657	GGGGACAG CUGAUGAG X CGAA AAGAUUUG	3166
2899	AAATCTTT C TGTCCCCA	658	UGGGGACA CUGAUGAG X CGAA AAAGAUUU	3167
2903	CTTTCTGT C CCCAATCC	659	GGAUUGGG CUGAUGAG X CGAA ACAGAAAG	3168
2910	TCCCCAAT C CCCTGGGA	660	UCCCAGGG CUGAUGAG X CGAA AUUGGGGA	3169
2920	CCTGGGAT T CTTCCCCG	661	CGGGGAAG CUGAUGAG X CGAA AUCCCAGG	3170
2921	CTGGGATT C TTCCCCGA	662	UCGGGGAA CUGAUGAG X CGAA AAUCCCAG	3171
2923	GGGATTCT T CCCCGATC	663	GAUCGGGG CUGAUGAG X CGAA AGAAUCCC	3172
2924	GGATTCTT C CCCGATCA	664	UGAUCGGG CUGAUGAG X CGAA AAGAAUCC	3173
2931	TCCCCGAT C ATCAGTTG	665	CAACUGAU CUGAUGAG X CGAA AUCGGGGA	3174
2934	CCGATCAT C AGTTGGAC	666	GUCCAACU CUGAUGAG X CGAA AUGAUCGG	3175
2938	TCATCAGT T GGACCCTG	667	CAGGGUCC CUGAUGAG X CGAA ACUGAUGA	3176
2950	CCCTGCAT T CAAAGCCA	668	UGGCUUUG CUGAUGAG X CGAA AUGCAGGG	3177
2951	CCTGCATT C AAAGCCAA	669	UUGGCUUU CUGAUGAG X CGAA AAUGCAGG	3178
2962	AGCCAACT C AGTAAATC	670	GAUUUACU CUGAUGAG X CGAA AGUUGGCU	3179
2966	AACTCAGT A AATCCAGA	671	UCUGGAUU CUGAUGAG X CGAA ACUGAGUU	3180
2970	CAGTAAAT C CAGATTGG	672	CCAAUCUG CUGAUGAG X CGAA AUUUACUG	3181
2976	ATCCAGAT T GGGACCTC	673	GAGGUCCC CUGAUGAG X CGAA AUCUGGAU	3182
2984	TGGGACCT C AACCCGCA	674	UGCGGGUU CUGAUGAG X CGAA AGGUCCCA	3183
3037	GGGAGCAT T CGGGCCAG	675	CUGGCCCG CUGAUGAG X CGAA AUGCUCCC	3184
3038	GGAGCATT C GGGCCAGG	676	CCUGGCCC CUGAUGAG X CGAA AAUGCUCC	3185
3049	GCCAGGGT T CACCCCTC	677	GAGGGGUG CUGAUGAG X CGAA ACCCUGGC	3186
3050	CCAGGGTT C ACCCCTCC	678	GGAGGGGU CUGAUGAG X CGAA AACCCUGG	3187
3057	TCACCCCT C CCCATGGG	679	CCCAUGGG CUGAUGAG X CGAA AGGGGUGA	3188
3073	GGGACTGT T GGGGTGGA	680	UCCACCCC CUGAUGAG X CGAA ACAGUCCC	3189
3087	GGAGCCCT C ACGCTCAG	681	CUGAGCGU CUGAUGAG X CGAA AGGGCUCC	3190
3093	CTCACGCT C AGGGCCTA	682	UAGGCCCU CUGAUGAG X CGAA AGCGUGAG	3191
3101	CAGGGCCT A CTCACAAC	683	GUUGUGAG CUGAUGAG X CGAA AGGCCCUG	3192
3104	GGCCTACT C ACAACTGT	684	ACAGUUGU CUGAUGAG X CGAA AGUAGGCC	3193
3123	CAGCAGCT C CTCCTCCT	685	AGGAGGAG CUGAUGAG X CGAA AGCUGCUG	3194
3126	CAGCTCCT C CTCCTGCC	686	GGCAGGAG CUGAUGAG X CGAA AGGAGCUG	3195
3129	CTCCTCCT C CTGCCTCC	687	GGAGGCAG CUGAUGAG X CGAA AGGAGGAG	3196
3136	TCCTGCCT C CACCAATC	688	GAUUGGUG CUGAUGAG X CGAA AGGCAGGA	3197
3144	CCACCAAT C GGCAGTCA	689	UGACUGCC CUGAUGAG X CGAA AUUGGUGG	3198
3151	TCGGCAGT C AGGAAGGC	690	GCCUUCCU CUGAUGAG X CGAA ACUGCCGA	3199
3165	GGCAGCCT A CTCCCTTA	691	UAAGGGAG CUGAUGAG X CGAA AGGCUGCC	3200
3168	AGCCTACT C CCTTATCT	692	AGAUAAGG CUGAUGAG X CGAA AGUAGGCU	3201
3172	TACTCCCT T ATCTCCAC	693	GUGGAGAU CUGAUGAG X CGAA AGGGAGUA	3202

Table 37

3173	ACTCCCTT A TCTCCACC	694	GGUGGAGA CUGAUGAG X CGAA AAGGGAGU	3203
3175	TCCCTTAT C TCCACCTC	695	GAGGUGGA CUGAUGAG X CGAA AUAAGGGA	3204
3177	CCTTATCT C CACCTCTA	696	UAGAGGUG CUGAUGAG X CGAA AGAUAAGG	3205
3183	CTCCACCT C TAAGGGAC	697	GUCCCUUA CUGAUGAG X CGAA AGGUGGAG	3206
3185	CCACCTCT A AGGGACAC	698	GUGUCCCU CUGAUGAG X CGAA AGAGGUGG	3207
3195	GGGACACT C ATCCTCAG	699	CUGAGGAU CUGAUGAG X CGAA AGUGUCCC	3208
3198	ACACTCAT C CTCAGGCC	700	GGCCUGAG CUGAUGAG X CGAA AUGAGUGU	3209
3201	CTCATCCT C AGGCCATG	701	CAUGGCCU CUGAUGAG X CGAA AGGAUGAG	3210

Input Sequence = AF100308. Cut Site = UH/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
AF100308 (Hepatitis B virus strain 2-18, 3215 bp)

Table 38

Table 38: Human HBV Inozyme and Substrate Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
9	AACTCCAC C ACTTTCCA	702	UGGAAAGU CUGAUGAG X CGAA IUGGAGUU	3211
10	ACTCCACC A CTTTCCAC	703	GUGGAAAG CUGAUGAG X CGAA IGUGGAGU	3212
12	TCCACCAC T TTCCACCA	704	UGGUGGAA CUGAUGAG X CGAA IUGGUGGA	3213
16	CCACTTTC C ACCAAACT	705	AGUUUGGU CUGAUGAG X CGAA IAAAGUGG	3214
17	CACTTTCC A CCAAACTC	706	GAGUUUGG CUGAUGAG X CGAA IGAAAGUG	3215
19	CTTTCCAC C AAACTCTT	707	AAGAGUUU CUGAUGAG X CGAA IUGGAAAG	3216
20	TTTCCACC A AACTCTTC	708	GAAGAGUU CUGAUGAG X CGAA IGUGGAAA	3217
24	CACCAAAC T CTTCAAGA	709	UCUUGAAG CUGAUGAG X CGAA IUUUGGUG	3218
26	CCAAACTC T TCAAGATC	710	GAUCUUGA CUGAUGAG X CGAA IAGUUUGG	3219
29	AACTCTTC A AGATCCCA	711	UGGGAUCU CUGAUGAG X CGAA IAAGAGUU	3220
35	TCAAGATC C CAGAGTCA	712	UGACUCUG CUGAUGAG X CGAA IAUCUUGA	3221
36	CAAGATCC C AGAGTCAG	713	CUGACUCU CUGAUGAG X CGAA IGAUCUUG	3222
37	AAGATCCC A GAGTCAGG	714	CCUGACUC CUGAUGAG X CGAA IGGAUCUU	3223
43	CCAGAGTC A GGGCCCTG	715	CAGGGCCC CUGAUGAG X CGAA IACUCUGG	3224
48	GTCAGGGC C CTGTACTT	716	AAGUACAG CUGAUGAG X CGAA ICCCUGAC	3225
49	TCAGGGCC C TGTACTTT	717	AAAGUACA CUGAUGAG X CGAA IGCCCUGA	3226
50	CAGGGCCC T GTACTTTC	718	GAAAGUAC CUGAUGAG X CGAA IGGCCCUG	3227
55	CCCTGTAC T TTCCTGCT	719	AGCAGGAA CUGAUGAG X CGAA IUACAGGG	3228
59	GTACTTTC C TGCTGGTG	720	CACCAGCA CUGAUGAG X CGAA IAAAGUAC	3229
60	TACTTTCC T GCTGGTGG	721	CCACCAGC CUGAUGAG X CGAA IGAAAGUA	3230
63	TTTCCTGC T GGTGGCTC	722	GAGCCACC CUGAUGAG X CGAA ICAGGAAA	3231
70	CTGGTGGC T CCAGTTCA	723	UGAACUGG CUGAUGAG X CGAA ICCACCAG	3232
72	GGTGGCTC C AGTTCAGG	724	CCUGAACU CUGAUGAG X CGAA IAGCCACC	3233
73	GTGGCTCC A GTTCAGGA	725	UCCUGAAC CUGAUGAG X CGAA IGAGCCAC	3234
78	TCCAGTTC A GGAACAGT	726	ACUGUUCC CUGAUGAG X CGAA IAACUGGA	3235
84	TCAGGAAC A GTGAGCCC	727	GGGCUCAC CUGAUGAG X CGAA IUUCCUGA	3236
91	CAGTGAGC C CTGCTCAG	728	CUGAGCAG CUGAUGAG X CGAA ICUCACUG	3237
92	AGTGAGCC C TGCTCAGA	729	UCUGAGCA CUGAUGAG X CGAA IGCUCACU	3238
93	GTGAGCCC T GCTCAGAA	730	UUCUGAGC CUGAUGAG X CGAA IGGCUCAC	3239
96	AGCCCTGC T CAGAATAC	731	GUAUUCUG CUGAUGAG X CGAA ICAGGGCU	3240
98	CCCTGCTC A GAATACTG	732	CAGUAUUC CUGAUGAG X CGAA IAGCAGGG	3241
105	CAGAATAC T GTCTCTGC	733	GCAGAGAC CUGAUGAG X CGAA IUAUUCUG	3242
109	ATACTGTC T CTGCCATA	734	UAUGGCAG CUGAUGAG X CGAA IACAGUAU	3243
111	ACTGTCTC T GCCATATC	735	GAUAUGGC CUGAUGAG X CGAA IAGACAGU	3244
114	GTCTCTGC C ATATCGTC	736	GACGAUAU CUGAUGAG X CGAA ICAGAGAC	3245
115	TCTCTGCC A TATCGTCA	737	UGACGAUA CUGAUGAG X CGAA IGCAGAGA	3246
123	ATATCGTC A ATCTTATC	738	GAUAAGAU CUGAUGAG X CGAA IACGAUAU	3247
127	CGTCAATC T TATCGAAG	739	CUUCGAUA CUGAUGAG X CGAA IAUUGACG	3248
138	TCGAAGAC T GGGGACCC	740	GGGUCCCC CUGAUGAG X CGAA IUCUUCGA	3249
145	CTGGGGAC C CTGTACCG	741	CGGUACAG CUGAUGAG X CGAA IUCCCCAG	3250
146	TGGGGACC C TGTACCGA	742	UCGGUACA CUGAUGAG X CGAA IGUCCCCA	3251
147	GGGGACCC T GTACCGAA	743	UUCGGUAC CUGAUGAG X CGAA IGGUCCCC	3252
152	CCCTGTAC C GAACATGG	744	CCAUGUUC CUGAUGAG X CGAA IUACAGGG	3253
157	TACCGAAC A TGGAGAAC	745	GUUCUCCA CUGAUGAG X CGAA IUUCGGUA	3254
166	TGGAGAAC A TCGCATCA	746	UGAUGCGA CUGAUGAG X CGAA IUUCUCCA	3255
171	AACATCGC A TCAGGACT	747	AGUCCUGA CUGAUGAG X CGAA ICGAUGUU	3256
174	ATCGCATC A GGACTCCT	748	AGGAGUCC CUGAUGAG X CGAA IAUGCGAU	3257

Table 38

179	ATCAGGAC T CCTAGGAC	749	GUCCUAGG CUGAUGAG X CGAA IUCCUGAU	3258
181	CAGGACTC C TAGGACCC	750	GGGUCCUA CUGAUGAG X CGAA IAGUCCUG	3259
182	AGGACTCC T AGGACCCC	751	GGGGUCCU CUGAUGAG X CGAA IGAGUCCU	3260
188	CCTAGGAC C CCTGCTCG	752	CGAGCAGG CUGAUGAG X CGAA IUCCUAGG	3261
189	CTAGGACC C CTGCTCGT	753	ACGAGCAG CUGAUGAG X CGAA IGUCCUAG	3262
190	TAGGACCC C TGCTCGTG	754	CACGAGCA CUGAUGAG X CGAA IGGUCCUA	3263
191	AGGACCCC T GCTCGTGT	755	ACACGAGC CUGAUGAG X CGAA IGGGUCCU	3264
194	ACCCCTGC T CGTGTTAC	756	GUAACACG CUGAUGAG X CGAA ICAGGGGU	3265
203	CGTGTTAC A GGCGGGGT	757	ACCCCGCC CUGAUGAG X CGAA IUAACACG	3266
217	GGTTTTTC T TGTTGACA	758	UGUCAACA CUGAUGAG X CGAA IAAAAACC	3267
225	TTGTTGAC A AAAATCCT	759	AGGAUUUU CUGAUGAG X CGAA IUCAACAA	3268
232	CAAAAATC C TCACAATA	760	UAUUGUGA CUGAUGAG X CGAA IAUUUUUG	3269
233	AAAAATCC T CACAATAC	761	GUAUUGUG CUGAUGAG X CGAA IGAUUUUU	3270
235	AAATCCTC A CAATACCA	762	UGGUAUUG CUGAUGAG X CGAA IAGGAUUU	3271
237	ATCCTCAC A ATACCACA	763	UGUGGUAU CUGAUGAG X CGAA IUGAGGAU	3272
242	CACAATAC C ACAGAGTC	764	GACUCUGU CUGAUGAG X CGAA IUAUUGUG	3273
243	ACAATACC A CAGAGTCT	765	AGACUCUG CUGAUGAG X CGAA IGUAUUGU	3274
245	AATACCAC A GAGTCTAG	766	CUAGACUC CUGAUGAG X CGAA IUGGUAUU	3275
251	ACAGAGTC T AGACTCGT	767	ACGAGUCU CUGAUGAG X CGAA IACUCUGU	3276
256	GTCTAGAC T CGTGGTGG	768	CCACCACG CUGAUGAG X CGAA IUCUAGAC	3277
267	TGGTGGAC T TCTCTCAA	769	UUGAGAGA CUGAUGAG X CGAA IUCCACCA	3278
270	TGGACTTC T CTCAATTT	770	AAAUUGAG CUGAUGAG X CGAA IAAGUCCA	3279
272	GACTTCTC T CAATTTTC	771	GAAAAUUG CUGAUGAG X CGAA IAGAAGUC	3280
274	CTTCTCTC A ATTTTCTA	772	UAGAAAAU CUGAUGAG X CGAA IAGAGAAG	3281
281	CAATTTTC T AGGGGGAA	773	UUCCCCCU CUGAUGAG X CGAA IAAAAUUG	3282
291	GGGGGAAC A CCCGTGTG	774	CACACGGG CUGAUGAG X CGAA IUUCCCCC	3283
293	GGGAACAC C CGTGTGTC	775	GACACACG CUGAUGAG X CGAA IUGUUCCC	3284
294	GGAACACC C GTGTGTCT	776	AGACACAC CUGAUGAG X CGAA IGUGUUCC	3285
302	CGTGTGTC T TGGCCAAA	777	UUUGGCCA CUGAUGAG X CGAA IACACACG	3286
307	GTCTTGGC C AAAATTCG	778	CGAAUUUU CUGAUGAG X CGAA ICCAAGAC	3287
308	TCTTGGCC A AAATTCGC	779	GCGAAUUU CUGAUGAG X CGAA IGCCAAGA	3288
317	AAATTCGC A GTCCCAAA	780	UUUGGGAC CUGAUGAG X CGAA ICGAAUUU	3289
321	TCGCAGTC C CAAATCTC	781	GAGAUUUG CUGAUGAG X CGAA IACUGCGA	3290
322	CGCAGTCC C AAATCTCC	782	GGAGAUUU CUGAUGAG X CGAA IGACUGCG	3291
323	GCAGTCCC A AATCTCCA	783	UGGAGAUU CUGAUGAG X CGAA IGGACUGC	3292
328	CCCAAATC T CCAGTCAC	784	GUGACUGG CUGAUGAG X CGAA IAUUUGGG	3293
330	CAAATCTC C AGTCACTC	785	GAGUGACU CUGAUGAG X CGAA IAGAUUUG	3294
331	AAATCTCC A GTCACTCA	786	UGAGUGAC CUGAUGAG X CGAA IGAGAUUU	3295
335	CTCCAGTC A CTCACCAA	787	UUGGUGAG CUGAUGAG X CGAA IACUGGAG	3296
337	CCAGTCAC T CACCAACC	788	GGUUGGUG CUGAUGAG X CGAA IUGACUGG	3297
339	AGTCACTC A CCAACCTG	789	CAGGUUGG CUGAUGAG X CGAA IAGUGACU	3298
341	TCACTCAC C AACCTGTT	790	AACAGGUU CUGAUGAG X CGAA IUGAGUGA	3299
342	CACTCACC A ACCTGTTG	791	CAACAGGU CUGAUGAG X CGAA IGUGAGUG	3300
345	TCACCAAC C TGTTGTCC	792	GGACAACA CUGAUGAG X CGAA IUUGGUGA	3301
346	CACCAACC T GTTGTCCT	793	AGGACAAC CUGAUGAG X CGAA IGUUGGUG	3302
353	CTGTTGTC C TCCAATTT	794	AAAUUGGA CUGAUGAG X CGAA IACAACAG	3303
354	TGTTGTCC T CCAATTTG	795	CAAAUUGG CUGAUGAG X CGAA IGACAACA	3304
356	TTGTCCTC C AATTTGTC	796	GACAAAUU CUGAUGAG X CGAA IAGGACAA	3305
357	TGTCCTCC A ATTTGTCC	797	GGACAAAU CUGAUGAG X CGAA IGAGGACA	3306
365	AATTTGTC C TGGTTATC	798	GAUAACCA CUGAUGAG X CGAA IACAAAUU	3307
366	ATTTGTCC T GGTTATCG	799	CGAUAACC CUGAUGAG X CGAA IGACAAAU	3308

Table 38

376	GTTATCGC T GGATGTGT	800	ACACAUCC CUGAUGAG X CGAA ICGAUAAC	3309
386	GATGTGTC T GCGGCGTT	801	AACGCCGC CUGAUGAG X CGAA IACACAUC	3310
400	GTTTTATC A TCTTCCTC	802	GAGGAAGA CUGAUGAG X CGAA IAUAAAAC	3311
403	TTATCATC T TCCTCTGC	803	GCAGAGGA CUGAUGAG X CGAA IAUGAUAA	3312
406	TCATCTTC C TCTGCATC	804	GAUGCAGA CUGAUGAG X CGAA IAAGAUGA	3313
407	CATCTTCC T CTGCATCC	805	GGAUGCAG CUGAUGAG X CGAA IGAAGAUG	3314
409	TCTTCCTC T GCATCCTG	806	CAGGAUGC CUGAUGAG X CGAA IAGGAAGA	3315
412	TCCTCTGC A TCCTGCTG	807	CAGCAGGA CUGAUGAG X CGAA ICAGAGGA	3316
415	TCTGCATC C TGCTGCTA	808	UAGCAGCA CUGAUGAG X CGAA IAUGCAGA	3317
416	CTGCATCC T GCTGCTAT	809	AUAGCAGC CUGAUGAG X CGAA IGAUGCAG	3318
419	CATCCTGC T GCTATGCC	810	GGCAUAGC CUGAUGAG X CGAA ICAGGAUG	3319
422	CCTGCTGC T ATGCCTCA	811	UGAGGCAU CUGAUGAG X CGAA ICAGCAGG	3320
427	TGCTATGC C TCATCTTC	812	GAAGAUGA CUGAUGAG X CGAA ICAUAGCA	3321
428	GCTATGCC T CATCTTCT	813	AGAAGAUG CUGAUGAG X CGAA IGCAUAGC	3322
430	TATGCCTC A TCTTCTTG	814	CAAGAAGA CUGAUGAG X CGAA IAGGCAUA	3323
433	GCCTCATC T TCTTGTTG	815	CAACAAGA CUGAUGAG X CGAA IAUGAGGC	3324
436	TCATCTTC T TGTTGGTT	816	AACCAACA CUGAUGAG X CGAA IAAGAUGA	3325
446	GTTGGTTC T TCTGGACT	817	AGUCCAGA CUGAUGAG X CGAA IAACCAAC	3326
449	GGTTCTTC T GGACTATC	818	GAUAGUCC CUGAUGAG X CGAA IAAGAACC	3327
454	TTCTGGAC T ATCAAGGT	819	ACCUUGAU CUGAUGAG X CGAA IUCCAGAA	3328
458	GGACTATC A AGGTATGT	820	ACAUACCU CUGAUGAG X CGAA IAUAGUCC	3329
470	TATGTTGC C CGTTTGTC	821	GACAAACG CUGAUGAG X CGAA ICAACAUA	3330
471	ATGTTGCC C GTTTGTCC	822	GGACAAAC CUGAUGAG X CGAA IGCAACAU	3331
479	CGTTTGTC C TCTAATTC	823	GAAUUAGA CUGAUGAG X CGAA IACAAACG	3332
480	GTTTGTCC T CTAATTCC	824	GGAAUUAG CUGAUGAG X CGAA IGACAAAC	3333
482	TTGTCCTC T AATTCCAG	825	CUGGAAUU CUGAUGAG X CGAA IAGGACAA	3334
488	TCTAATTC C AGGATCAT	826	AUGAUCCU CUGAUGAG X CGAA IAAUUAGA	3335
489	CTAATTCC A GGATCATC	827	GAUGAUCC CUGAUGAG X CGAA IGAAUUAG	3336
495	CCAGGATC A TCAACAAC	828	GUUGUUGA CUGAUGAG X CGAA IAUCCUGG	3337
498	GGATCATC A ACAACCAG	829	CUGGUUGU CUGAUGAG X CGAA IAUGAUCC	3338
501	TCATCAAC A ACCAGCAC	830	GUGCUGGU CUGAUGAG X CGAA IUUGAUGA	3339
504	TCAACAAC C AGCACCGG	831	CCGGUGCU CUGAUGAG X CGAA IUUGUUGA	3340
505	CAACAACC A GCACCGGA	832	UCCGGUGC CUGAUGAG X CGAA IGUUGUUG	3341
508	CAACCAGC A CCGGACCA	833	UGGUCCGG CUGAUGAG X CGAA ICUGGUUG	3342
510	ACCAGCAC C GGACCATG	834	CAUGGUCC CUGAUGAG X CGAA IUGCUGGU	3343
515	CACCGGAC C ATGCAAAA	835	UUUUGCAU CUGAUGAG X CGAA IUCCGGUG	3344
516	ACCGGACC A TGCAAAAC	836	GUUUUGCA CUGAUGAG X CGAA IGUCCGGU	3345
520	GACCATGC A AAACCTGC	837	GCAGGUUU CUGAUGAG X CGAA ICAUGGUC	3346
525	TGCAAAAC C TGCACAAC	838	GUUGUGCA CUGAUGAG X CGAA IUUUUGCA	3347
526	GCAAAACC T GCACAACT	839	AGUUGUGC CUGAUGAG X CGAA IGUUUUGC	3348
529	AAACCTGC A CAACTCCT	840	AGGAGUUG CUGAUGAG X CGAA ICAGGUUU	3349
531	ACCTGCAC A ACTCCTGC	841	GCAGGAGU CUGAUGAG X CGAA IUGCAGGU	3350
534	TGCACAAC T CCTGCTCA	842	UGAGCAGG CUGAUGAG X CGAA IUUGUGCA	3351
536	CACAACTC C TGCTCAAG	843	CUUGAGCA CUGAUGAG X CGAA IAGUUGUG	3352
537	ACAACTCC T GCTCAAGG	844	CCUUGAGC CUGAUGAG X CGAA IGAGUUGU	3353
540	ACTCCTGC T CAAGGAAC	845	GUUCCUUG CUGAUGAG X CGAA ICAGGAGU	3354
542	TCCTGCTC A AGGAACCT	846	AGGUUCCU CUGAUGAG X CGAA IAGCAGGA	3355
549	CAAGGAAC C TCTATGTT	847	AACAUAGA CUGAUGAG X CGAA IUUCCUUG	3356
550	AAGGAACC T CTATGTTT	848	AAACAUAG CUGAUGAG X CGAA IGUUCCUU	3357
552	GGAACCTC T ATGTTTCC	849	GGAAACAU CUGAUGAG X CGAA IAGGUUCC	3358
560	TATGTTTC C CTCATGTT	850	AACAUGAG CUGAUGAG X CGAA IAAACAUA	3359

Table 38

561	ATGTTTCC C TCATGTTG	851	CAACAUGA CUGAUGAG X CGAA IGAAACAU	3360
562	TGTTTCCC T CATGTTGC	852	GCAACAUG CUGAUGAG X CGAA IGGAAACA	3361
564	TTTCCCTC A TGTTGCTG	853	CAGCAACA CUGAUGAG X CGAA IAGGGAAA	3362
571	CATGTTGC T GTACAAAA	854	UUUUGUAC CUGAUGAG X CGAA ICAACAUG	3363
576	TGCTGTAC A AAACCTAC	855	GUAGGUUU CUGAUGAG X CGAA IUACAGCA	3364
581	TACAAAAC C TACGGACG	856	CGUCCGUA CUGAUGAG X CGAA IUUUUGUA	3365
582	ACAAAACC T ACGGACGG	857	CCGUCCGU CUGAUGAG X CGAA IGUUUUGU	3366
595	ACGGAAAC T GCACCTGT	858	ACAGGUGC CUGAUGAG X CGAA IUUUCCGU	3367
598	GAAACTGC A CCTGTATT	859	AAUACAGG CUGAUGAG X CGAA ICAGUUUC	3368
600	AACTGCAC C TGTATTCC	860	GGAAUACA CUGAUGAG X CGAA IUGCAGUU	3369
601	ACTGCACC T GTATTCCC	861	GGGAAUAC CUGAUGAG X CGAA IGUGCAGU	3370
608	CTGTATTC C CATCCCAT	862	AUGGGAUG CUGAUGAG X CGAA IAAUACAG	3371
609	TGTATTCC C ATCCCATC	863	GAUGGGAU CUGAUGAG X CGAA IGAAUACA	3372
610	GTATTCCC A TCCCATCA	864	UGAUGGGA CUGAUGAG X CGAA IGGAAUAC	3373
613	TTCCCATC C CATCATCT	865	AGAUGAUG CUGAUGAG X CGAA IAUGGGAA	3374
614	TCCCATCC C ATCATCTT	866	AAGAUGAU CUGAUGAG X CGAA IGAUGGGA	3375
615	CCCATCCC A TCATCTTG	867	CAAGAUGA CUGAUGAG X CGAA IGGAUGGG	3376
618	ATCCCATC A TCTTGGGC	868	GCCCAAGA CUGAUGAG X CGAA IAUGGGAU	3377
621	CCATCATC T TGGGCTTT	869	AAAGCCCA CUGAUGAG X CGAA IAUGAUGG	3378
627	TCTTGGGC T TTCGCAAA	870	UUUGCGAA CUGAUGAG X CGAA ICCCAAGA	3379
633	GCTTTCGC A AAATACCT	871	AGGUAUUU CUGAUGAG X CGAA ICGAAAGC	3380
640	CAAAATAC C TATGGGAG	872	CUCCCAUA CUGAUGAG X CGAA IUAUUUUG	3381
641	AAAATACC T ATGGGAGT	873	ACUCCCAU CUGAUGAG X CGAA IGUAUUUU	3382
654	GAGTGGGC C TCAGTCCG	874	CGGACUGA CUGAUGAG X CGAA ICCCACUC	3383
655	AGTGGGCC T CAGTCCGT	875	ACGGACUG CUGAUGAG X CGAA IGCCCACU	3384
657	TGGGCCTC A GTCCGTTT	876	AAACGGAC CUGAUGAG X CGAA IAGGCCCA	3385
661	CCTCAGTC C GTTTCTCT	877	AGAGAAAC CUGAUGAG X CGAA IACUGAGG	3386
667	TCCGTTTC T CTTGGCTC	878	GAGCCAAG CUGAUGAG X CGAA IAAACGGA	3387
669	CGTTTCTC T TGGCTCAG	879	CUGAGCCA CUGAUGAG X CGAA IAGAAACG	3388
674	CTCTTGGC T CAGTTTAC	880	GUAAACUG CUGAUGAG X CGAA ICCAAGAG	3389
676	CTTGGCTC A GTTTACTA	881	UAGUAAAC CUGAUGAG X CGAA IAGCCAAG	3390
683	CAGTTTAC T AGTGCCAT	882	AUGGCACU CUGAUGAG X CGAA IUAAACUG	3391
689	ACTAGTGC C ATTTGTTC	883	GAACAAAU CUGAUGAG X CGAA ICACUAGU	3392
690	CTAGTGCC A TTTGTTCA	884	UGAACAAA CUGAUGAG X CGAA IGCACUAG	3393
698	ATTTGTTC A GTGGTTCG	885	CGAACCAC CUGAUGAG X CGAA IAACAAAU	3394
713	CGTAGGGC T TTCCCCCA	886	UGGGGGAA CUGAUGAG X CGAA ICCCUACG	3395
717	GGGCTTTC C CCCACTGT	887	ACAGUGGG CUGAUGAG X CGAA IAAAGCCC	3396
718	GGCTTTCC C CCACTGTC	888	GACAGUGG CUGAUGAG X CGAA IGAAAGCC	3397
719	GCTTTCCC C CACTGTCT	889	AGACAGUG CUGAUGAG X CGAA IGGAAAGC	3398
720	CTTTCCCC C ACTGTCTG	890	CAGACAGU CUGAUGAG X CGAA IGGGAAAG	3399
721	TTTCCCCC A CTGTCTGG	891	CCAGACAG CUGAUGAG X CGAA IGGGGAAA	3400
723	TCCCCCAC T GTCTGGCT	892	AGCCAGAC CUGAUGAG X CGAA IUGGGGGA	3401
727	CCACTGTC T GGCTTTCA	893	UGAAAGCC CUGAUGAG X CGAA IACAGUGG	3402
731	TGTCTGGC T TTCAGTTA	894	UAACUGAA CUGAUGAG X CGAA ICCAGACA	3403
735	TGGCTTTC A GTTATATG	895	CAUAUAAC CUGAUGAG X CGAA IAAAGCCA	3404
764	TTGGGGGC C AAGTCTGT	896	ACAGACUU CUGAUGAG X CGAA ICCCCCAA	3405
765	TGGGGGCC A AGTCTGTA	897	UACAGACU CUGAUGAG X CGAA IGCCCCCA	3406
770	GCCAAGTC T GTACAACA	898	UGUUGUAC CUGAUGAG X CGAA IACUUGGC	3407
775	GTCTGTAC A ACATCTTG	899	CAAGAUGU CUGAUGAG X CGAA IUACAGAC	3408
778	TGTACAAC A TCTTGAGT	900	ACUCAAGA CUGAUGAG X CGAA IUUGUACA	3409
781	ACAACATC T TGAGTCCC	901	GGGACUCA CUGAUGAG X CGAA IAUGUUGU	3410

Table 38

788	CTTGAGTC C CTTTATGC	902	GCAUAAAG CUGAUGAG X CGAA IACUCAAG	3411
789	TTGAGTCC C TTTATGCC	903	GGCAUAAA CUGAUGAG X CGAA IGACUCAA	3412
790	TGAGTCCC T TTATGCCG	904	CGGCAUAA CUGAUGAG X CGAA IGGACUCA	3413
797	CTTTATGC C GCTGTTAC	905	GUAACAGC CUGAUGAG X CGAA ICAUAAAG	3414
800	TATGCCGC T GTTACCAA	906	UUGGUAAC CUGAUGAG X CGAA ICGGCAUA	3415
806	GCTGTTAC C AATTTTCT	907	AGAAAAUU CUGAUGAG X CGAA IUAACAGC	3416
807	CTGTTACC A ATTTTCTT	908	AAGAAAAU CUGAUGAG X CGAA IGUAACAG	3417
814	CAATTTTC T TTTGTCTT	909	AAGACAAA CUGAUGAG X CGAA IAAAAUUG	3418
821	CTTTTGTC T TTGGGTAT	910	AUACCCAA CUGAUGAG X CGAA IACAAAAG	3419
832	GGGTATAC A TTTAAACC	911	GGUUUAAA CUGAUGAG X CGAA IUAUACCC	3420
840	ATTTAAAC C CTCACAAA	912	UUUGUGAG CUGAUGAG X CGAA IUUUAAAU	3421
841	TTTAAACC C TCACAAAA	913	UUUUGUGA CUGAUGAG X CGAA IGUUUAAA	3422
842	TTAAACCC T CACAAAAC	914	GUUUUGUG CUGAUGAG X CGAA IGGUUUAA	3423
844	AAACCCTC A CAAAACAA	915	UUGUUUUG CUGAUGAG X CGAA IAGGGUUU	3424
846	ACCCTCAC A AAACAAAA	916	UUUUGUUU CUGAUGAG X CGAA IUGAGGGU	3425
851	CACAAAAC A AAAAGATG	917	CAUCUUUU CUGAUGAG X CGAA IUUUUGUG	3426
869	GGATATTC C CTTAACTT	918	AAGUUAAG CUGAUGAG X CGAA IAAUAUCC	3427
870	GATATTCC C TTAACTTC	919	GAAGUUAA CUGAUGAG X CGAA IGAAUAUC	3428
871	ATATTCCC T TAACTTCA	920	UGAAGUUA CUGAUGAG X CGAA IGGAAUAU	3429
876	CCCTTAAC T TCATGGGA	921	UCCCAUGA CUGAUGAG X CGAA IUUAAGGG	3430
879	TTAACTTC A TGGGATAT	922	AUAUCCCA CUGAUGAG X CGAA IAAGUUAA	3431
906	GTTGGGGC A CATTGCCA	923	UGGCAAUG CUGAUGAG X CGAA ICCCCAAC	3432
908	TGGGGCAC A TTGCCACA	924	UGUGGCAA CUGAUGAG X CGAA IUGCCCCA	3433
913	CACATTGC C ACAGGAAC	925	GUUCCUGU CUGAUGAG X CGAA ICAAUGUG	3434
914	ACATTGCC A CAGGAACA	926	UGUUCCUG CUGAUGAG X CGAA IGCAAUGU	3435
916	ATTGCCAC A GGAACATA	927	UAUGUUCC CUGAUGAG X CGAA IUGGCAAU	3436
922	ACAGGAAC A TATTGTAC	928	GUACAAUA CUGAUGAG X CGAA IUUCCUGU	3437
931	TATTGTAC A AAAAATCA	929	UGAUUUUU CUGAUGAG X CGAA IUACAAUA	3438
939	AAAAAATC A AAATGTGT	930	ACACAUUU CUGAUGAG X CGAA IAUUUUUU	3439
958	TAGGAAAC T TCCTGTAA	931	UUACAGGA CUGAUGAG X CGAA IUUUCCUA	3440
961	GAAACTTC C TGTAAACA	932	UGUUUACA CUGAUGAG X CGAA IAAGUUUC	3441
962	AAACTTCC T GTAAACAG	933	CUGUUUAC CUGAUGAG X CGAA IGAAGUUU	3442
969	CTGTAAAC A GGCCTATT	934	AAUAGGCC CUGAUGAG X CGAA IUUUACAG	3443
973	AAACAGGC C TATTGATT	935	AAUCAAUA CUGAUGAG X CGAA ICCUGUUU	3444
974	AACAGGCC T ATTGATTG	936	CAAUCAAU CUGAUGAG X CGAA IGCCUGUU	3445
994	AGTATGTC A ACGAATTG	937	CAAUUCGU CUGAUGAG X CGAA IACAUACU	3446
1009	TGTGGGTC T TTTGGGGT	938	ACCCCAAA CUGAUGAG X CGAA IACCCACA	3447
1022	GGGTTTGC C GCCCCTTT	939	AAAGGGGC CUGAUGAG X CGAA ICAAACCC	3448
1025	TTTGCCGC C CCTTTCAC	940	GUGAAAGG CUGAUGAG X CGAA ICGGCAAA	3449
1026	TTGCCGCC C CTTTCACG	941	CGUGAAAG CUGAUGAG X CGAA IGCGGCAA	3450
1027	TGCCGCCC C TTTCACGC	942	GCGUGAAA CUGAUGAG X CGAA IGGCGGCA	3451
1028	GCCGCCCC T TTCACGCA	943	UGCGUGAA CUGAUGAG X CGAA IGGGCGGC	3452
1032	CCCCTTTC A CGCAATGT	944	ACAUUGCG CUGAUGAG X CGAA IAAAGGGG	3453
1036	TTTCACGC A ATGTGGAT	945	AUCCACAU CUGAUGAG X CGAA ICGUGAAA	3454
1049	GGATATTC T GCTTTAAT	946	AUUAAAGC CUGAUGAG X CGAA IAAUAUCC	3455
1052	TATTCTGC T TTAATGCC	947	GGCAUUAA CUGAUGAG X CGAA ICAGAAUA	3456
1060	TTTAATGC C TTTATATG	948	CAUAUAAA CUGAUGAG X CGAA ICAUUAAA	3457
1061	TTAATGCC T TTATATGC	949	GCAUAUAA CUGAUGAG X CGAA IGCAUUAA	3458
1070	TTATATGC A TGCATACA	950	UGUAUGCA CUGAUGAG X CGAA ICAUAUAA	3459
1074	ATGCATGC A TACAAGCA	951	UGCUUGUA CUGAUGAG X CGAA ICAUGCAU	3460
1078	ATGCATAC A AGCAAAAC	952	GUUUUGCU CUGAUGAG X CGAA IUAUGCAU	3461

Table 38

1082	ATACAAGC A AAACAGGC	953	GCCUGUUU CUGAUGAG X CGAA ICUUGUAU	3462
1087	AGCAAAAC A GGCTTTTA	954	UAAAAGCC CUGAUGAG X CGAA IUUUUGCU	3463
1091	AAACAGGC T TTTACTTT	955	AAAGUAAA CUGAUGAG X CGAA ICCUGUUU	3464
1097	GCTTTTAC T TTCTCGCC	956	GGCGAGAA CUGAUGAG X CGAA IUAAAAGC	3465
1101	TTACTTTC T CGCCAACT	957	AGUUGGCG CUGAUGAG X CGAA IAAAGUAA	3466
1105	TTTCTCGC C AACTTACA	958	UGUAAGUU CUGAUGAG X CGAA ICGAGAAA	3467
1106	TTCTCGCC A ACTTACAA	959	UUGUAAGU CUGAUGAG X CGAA IGCGAGAA	3468
1109	TCGCCAAC T TACAAGGC	960	GCCUUGUA CUGAUGAG X CGAA IUUGGCGA	3469
1113	CAACTTAC A AGGCCTTT	961	AAAGGCCU CUGAUGAG X CGAA IUAAGUUG	3470
1118	TACAAGGC C TTTCTAAG	962	CUUAGAAA CUGAUGAG X CGAA ICCUUGUA	3471
1119	ACAAGGCC T TTCTAAGT	963	ACUUAGAA CUGAUGAG X CGAA IGCCUUGU	3472
1123	GGCCTTTC T AAGTAAAC	964	GUUUACUU CUGAUGAG X CGAA IAAAGGCC	3473
1132	AAGTAAAC A GTATGTGA	965	UCACAUAC CUGAUGAG X CGAA IUUUACUU	3474
1143	ATGTGAAC C TTTACCCC	966	GGGGUAAA CUGAUGAG X CGAA IUUCACAU	3475
1144	TGTGAACC T TTACCCCG	967	CGGGGUAA CUGAUGAG X CGAA IGUUCACA	3476
1149	ACCTTTAC C CCGTTGCT	968	AGCAACGG CUGAUGAG X CGAA IUAAAGGU	3477
1150	CCTTTACC C CGTTGCTC	969	GAGCAACG CUGAUGAG X CGAA IGUAAAGG	3478
1151	CTTTACCC C GTTGCTCG	970	CGAGCAAC CUGAUGAG X CGAA IGGUAAAG	3479
1157	CCCGTTGC T CGGCAACG	971	CGUUGCCG CUGAUGAG X CGAA ICAACGGG	3480
1162	TGCTCGGC A ACGGCCTG	972	CAGGCCGU CUGAUGAG X CGAA ICCGAGCA	3481
1168	GCAACGGC C TGGTCTAT	973	AUAGACCA CUGAUGAG X CGAA ICCGUUGC	3482
1169	CAACGGCC T GGTCTATG	974	CAUAGACC CUGAUGAG X CGAA IGCCGUUG	3483
1174	GCCTGGTC T ATGCCAAG	975	CUUGGCAU CUGAUGAG X CGAA IACCAGGC	3484
1179	GTCTATGC C AAGTGTTT	976	AAACACUU CUGAUGAG X CGAA ICAUAGAC	3485
1180	TCTATGCC A AGTGTTTG	977	CAAACACU CUGAUGAG X CGAA IGCAUAGA	3486
1190	GTGTTTGC T GACGCAAC	978	GUUGCGUC CUGAUGAG X CGAA ICAAACAC	3487
1196	GCTGACGC A ACCCCCAC	979	GUGGGGGU CUGAUGAG X CGAA ICGUCAGC	3488
1199	GACGCAAC C CCCACTGG	980	CCAGUGGG CUGAUGAG X CGAA IUUGCGUC	3489
1200	ACGCAACC C CCACTGGT	981	ACCAGUGG CUGAUGAG X CGAA IGUUGCGU	3490
1201	CGCAACCC C CACTGGTT	982	AACCAGUG CUGAUGAG X CGAA IGGUUGCG	3491
1202	GCAACCCC C ACTGGTTG	983	CAACCAGU CUGAUGAG X CGAA IGGGUUGC	3492
1203	CAACCCCC A CTGGTTGG	984	CCAACCAG CUGAUGAG X CGAA IGGGGUUG	3493
1205	ACCCCCAC T GGTTGGGG	985	CCCCAACC CUGAUGAG X CGAA IUGGGGGU	3494
1215	GTTGGGGC T TGGCCATA	986	UAUGGCCA CUGAUGAG X CGAA ICCCCAAC	3495
1220	GGCTTGGC C ATAGGCCA	987	UGGCCUAU CUGAUGAG X CGAA ICCAAGCC	3496
1221	GCTTGGCC A TAGGCCAT	988	AUGGCCUA CUGAUGAG X CGAA IGCCAAGC	3497
1227	CCATAGGC C ATCAGCGC	989	GCGCUGAU CUGAUGAG X CGAA ICCUAUGG	3498
1228	CATAGGCC A TCAGCGCA	990	UGCGCUGA CUGAUGAG X CGAA IGCCUAUG	3499
1231	AGGCCATC A GCGCATGC	991	GCAUGCGC CUGAUGAG X CGAA IAUGGCCU	3500
1236	ATCAGCGC A TGCGTGGA	992	UCCACGCA CUGAUGAG X CGAA ICGCUGAU	3501
1247	CGTGGAAC C TTTGTGTC	993	GACACAAA CUGAUGAG X CGAA IUUCCACG	3502
1248	GTGGAACC T TTGTGTCT	994	AGACACAA CUGAUGAG X CGAA IGUUCCAC	3503
1256	TTTGTGTC T CCTCTGCC	995	GGCAGAGG CUGAUGAG X CGAA IACACAAA	3504
1258	TGTGTCTC C TCTGCCGA	996	UCGGCAGA CUGAUGAG X CGAA IAGACACA	3505
1259	GTGTCTCC T CTGCCGAT	997	AUCGGCAG CUGAUGAG X CGAA IGAGACAC	3506
1261	GTCTCCTC T GCCGATCC	998	GGAUCGGC CUGAUGAG X CGAA IAGGAGAC	3507
1264	TCCTCTGC C GATCCATA	999	UAUGGAUC CUGAUGAG X CGAA ICAGAGGA	3508
1269	TGCCGATC C ATACCGCG	1000	CGCGGUAU CUGAUGAG X CGAA IAUCGGCA	3509
1270	GCCGATCC A TACCGCGG	1001	CCGCGGUA CUGAUGAG X CGAA IGAUCGGC	3510
1274	ATCCATAC C GCGGAACT	1002	AGUUCCGC CUGAUGAG X CGAA IUAUGGAU	3511
1282	CGCGGAAC T CCTAGCCG	1003	CGGCUAGG CUGAUGAG X CGAA IUUCCGCG	3512

Table 38

1284	CGGAACTC C TAGCCGCT	1004	AGCGGCUA CUGAUGAG X CGAA IAGUUCCG	3513
1285	GGAACTCC T AGCCGCTT	1005	AAGCGGCU CUGAUGAG X CGAA IGAGUUCC	3514
1289	CTCCTAGC C GCTTGTTT	1006	AAACAAGC CUGAUGAG X CGAA ICUAGGAG	3515
1292	CTAGCCGC T TGTTTTGC	1007	GCAAAACA CUGAUGAG X CGAA ICGGCUAG	3516
1301	TGTTTTGC T CGCAGCAG	1008	CUGCUGCG CUGAUGAG X CGAA ICAAAACA	3517
1305	TTGCTCGC A GCAGGTCT	1009	AGACCUGC CUGAUGAG X CGAA ICGAGCAA	3518
1308	CTCGCAGC A GGTCTGGG	1010	CCCAGACC CUGAUGAG X CGAA ICUGCGAG	3519
1313	AGCAGGTC T GGGGCAAA	1011	UUUGCCCC CUGAUGAG X CGAA IACCUGCU	3520
1319	TCTGGGGC A AAACTCAT	1012	AUGAGUUU CUGAUGAG X CGAA ICCCCAGA	3521
1324	GGCAAAAC T CATCGGGA	1013	UCCCGAUG CUGAUGAG X CGAA IUUUUGCC	3522
1326	CAAAACTC A TCGGGACT	1014	AGUCCCGA CUGAUGAG X CGAA IAGUUUUG	3523
1334	ATCGGGAC T GACAATTC	1015	GAAUUGUC CUGAUGAG X CGAA IUCCCGAU	3524
1338	GGACTGAC A ATTCTGTC	1016	GACAGAAU CUGAUGAG X CGAA IUCAGUCC	3525
1343	GACAATTC T GTCGTGCT	1017	AGCACGAC CUGAUGAG X CGAA IAAUUGUC	3526
1351	TGTCGTGC T CTCCCGCA	1018	UGCGGGAG CUGAUGAG X CGAA ICACGACA	3527
1353	TCGTGCTC T CCCGCAAA	1019	UUUGCGGG CUGAUGAG X CGAA IAGCACGA	3528
1355	GTGCTCTC C CGCAAATA	1020	UAUUUGCG CUGAUGAG X CGAA IAGAGCAC	3529
1356	TGCTCTCC C GCAAATAT	1021	AUAUUUGC CUGAUGAG X CGAA IGAGAGCA	3530
1359	TCTCCCGC A AATATACA	1022	UGUAUAUU CUGAUGAG X CGAA ICGGGAGA	3531
1367	AAATATAC A TCATTTCC	1023	GGAAAUGA CUGAUGAG X CGAA IUAUAUUU	3532
1370	TATACATC A TTTCCATG	1024	CAUGGAAA CUGAUGAG X CGAA IAUGUAUA	3533
1375	ATCATTTC C ATGGCTGC	1025	GCAGCCAU CUGAUGAG X CGAA IAAAUGAU	3534
1376	TCATTTCC A TGGCTGCT	1026	AGCAGCCA CUGAUGAG X CGAA IGAAAUGA	3535
1381	TCCATGGC T GCTAGGCT	1027	AGCCUAGC CUGAUGAG X CGAA ICCAUGGA	3536
1384	ATGGCTGC T AGGCTGTG	1028	CACAGCCU CUGAUGAG X CGAA ICAGCCAU	3537
1389	TGCTAGGC T GTGCTGCC	1029	GGCAGCAC CUGAUGAG X CGAA ICCUAGCA	3538
1394	GGCTGTGC T GCCAACTG	1030	CAGUUGGC CUGAUGAG X CGAA ICACAGCC	3539
1397	TGTGCTGC C AACTGGAT	1031	AUCCAGUU CUGAUGAG X CGAA ICAGCACA	3540
1398	GTGCTGCC A ACTGGATC	1032	GAUCCAGU CUGAUGAG X CGAA IGCAGCAC	3541
1401	CTGCCAAC T GGATCCTA	1033	UAGGAUCC CUGAUGAG X CGAA IUUGGCAG	3542
1407	ACTGGATC C TACGCGGG	1034	CCCGCGUA CUGAUGAG X CGAA IAUCCAGU	3543
1408	CTGGATCC T ACGCGGGA	1035	UCCCGCGU CUGAUGAG X CGAA IGAUCCAG	3544
1421	GGGACGTC C TTTGTTTA	1036	UAAACAAA CUGAUGAG X CGAA IACGUCCC	3545
1422	GGACGTCC T TTGTTTAC	1037	GUAAACAA CUGAUGAG X CGAA IGACGUCC	3546
1434	TTTACGTC C CGTCGGCG	1038	CGCCGACG CUGAUGAG X CGAA IACGUAAA	3547
1435	TTACGTCC C GTCGGCGC	1039	GCGCCGAC CUGAUGAG X CGAA IGACGUAA	3548
1444	GTCGGCGC T GAATCCCG	1040	CGGGAUUC CUGAUGAG X CGAA ICGCCGAC	3549
1450	GCTGAATC C CGCGGACG	1041	CGUCCGCG CUGAUGAG X CGAA IAUUCAGC	3550
1451	CTGAATCC C GCGGACGA	1042	UCGUCCGC CUGAUGAG X CGAA IGAUUCAG	3551
1461	CGGACGAC C CCTCCCGG	1043	CCGGGAGG CUGAUGAG X CGAA IUCGUCCG	3552
1462	GGACGACC C CTCCCGGG	1044	CCCGGGAG CUGAUGAG X CGAA IGUCGUCC	3553
1463	GACGACCC C TCCCGGGG	1045	CCCCGGGA CUGAUGAG X CGAA IGGUCGUC	3554
1464	ACGACCCC T CCCGGGGC	1046	GCCCCGGG CUGAUGAG X CGAA IGGGUCGU	3555
1466	GACCCCTC C CGGGGCCG	1047	CGGCCCCG CUGAUGAG X CGAA IAGGGGUC	3556
1467	ACCCCTCC C GGGGCCGC	1048	GCGGCCCC CUGAUGAG X CGAA IGAGGGGU	3557
1473	CCCGGGGC C GCTTGGGG	1049	CCCCAAGC CUGAUGAG X CGAA ICCCCGGG	3558
1476	GGGGCCGC T TGGGGCTC	1050	GAGCCCCA CUGAUGAG X CGAA ICGGCCCC	3559
1483	CTTGGGGC T CTACCGCC	1051	GGCGGUAG CUGAUGAG X CGAA ICCCCAAG	3560
1485	TGGGGCTC T ACCGCCCG	1052	CGGGCGGU CUGAUGAG X CGAA IAGCCCCA	3561
1488	GGCTCTAC C GCCCGCTT	1053	AAGCGGGC CUGAUGAG X CGAA IUAGAGCC	3562
1491	TCTACCGC C CGCTTCTC	1054	GAGAAGCG CUGAUGAG X CGAA ICGGUAGA	3563

Table 38

1492	CTACCGCC C GCTTCTCC	1055	GGAGAAGC CUGAUGAG X CGAA IGCGGUAG	3564
1495	CCGCCCGC T TCTCCGCC	1056	GGCGGAGA CUGAUGAG X CGAA ICGGGCGG	3565
1498	CCCGCTTC T CCGCCTAT	1057	AUAGGCGG CUGAUGAG X CGAA IAAGCGGG	3566
1500	CGCTTCTC C GCCTATTG	1058	CAAUAGGC CUGAUGAG X CGAA IAGAAGCG	3567
1503	TTCTCCGC C TATTGTAC	1059	GUACAAUA CUGAUGAG X CGAA ICGGAGAA	3568
1504	TCTCCGCC T ATTGTACC	1060	GGUACAAU CUGAUGAG X CGAA IGCGGAGA	3569
1512	TATTGTAC C GACCGTCC	1061	GGACGGUC CUGAUGAG X CGAA IUACAAUA	3570
1516	GTACCGAC C GTCCACGG	1062	CCGUGGAC CUGAUGAG X CGAA IUCGGUAC	3571
1520	CGACCGTC C ACGGGGCG	1063	CGCCCCGU CUGAUGAG X CGAA IACGGUCG	3572
1521	GACCGTCC A CGGGGCGC	1064	GCGCCCCG CUGAUGAG X CGAA IGACGGUC	3573
1530	CGGGGCGC A CCTCTCTT	1065	AAGAGAGG CUGAUGAG X CGAA ICGCCCCG	3574
1532	GGGCGCAC C TCTCTTTA	1066	UAAAGAGA CUGAUGAG X CGAA IUGCGCCC	3575
1533	GGCGCACC T CTCTTTAC	1067	GUAAAGAG CUGAUGAG X CGAA IGUGCGCC	3576
1535	CGCACCTC T CTTTACGC	1068	GCGUAAAG CUGAUGAG X CGAA IAGGUGCG	3577
1537	CACCTCTC T TTACGCGG	1069	CCGCGUAA CUGAUGAG X CGAA IAGAGGUG	3578
1548	ACGCGGAC T CCCCGTCT	1070	AGACGGGG CUGAUGAG X CGAA IUCCGCGU	3579
1550	GCGGACTC C CCGTCTGT	1071	ACAGACGG CUGAUGAG X CGAA IAGUCCGC	3580
1551	CGGACTCC C CGTCTGTG	1072	CACAGACG CUGAUGAG X CGAA IGAGUCCG	3581
1552	GGACTCCC C GTCTGTGC	1073	GCACAGAC CUGAUGAG X CGAA IGGAGUCC	3582
1556	TCCCCGTC T GTGCCTTC	1074	GAAGGCAC CUGAUGAG X CGAA IACGGGGA	3583
1561	GTCTGTGC C TTCTCATC	1075	GAUGAGAA CUGAUGAG X CGAA ICACAGAC	3584
1562	TCTGTGCC T TCTCATCT	1076	AGAUGAGA CUGAUGAG X CGAA IGCACAGA	3585
1565	GTGCCTTC T CATCTGCC	1077	GGCAGAUG CUGAUGAG X CGAA IAAGGCAC	3586
1567	GCCTTCTC A TCTGCCGG	1078	CCGGCAGA CUGAUGAG X CGAA IAGAAGGC	3587
1570	TTCTCATC T GCCGGACC	1079	GGUCCGGC CUGAUGAG X CGAA IAUGAGAA	3588
1573	TCATCTGC C GGACCGTG	1080	CACGGUCC CUGAUGAG X CGAA ICAGAUGA	3589
1578	TGCCGGAC C GTGTGCAC	1081	GUGCACAC CUGAUGAG X CGAA IUCCGGCA	3590
1585	CCGTGTGC A CTTCGCTT	1082	AAGCGAAG CUGAUGAG X CGAA ICACACGG	3591
1587	GTGTGCAC T TCGCTTCA	1083	UGAAGCGA CUGAUGAG X CGAA IUGCACAC	3592
1592	CACTTCGC T TCACCTCT	1084	AGAGGUGA CUGAUGAG X CGAA ICGAAGUG	3593
1595	TTCGCTTC A CCTCTGCA	1085	UGCAGAGG CUGAUGAG X CGAA IAAGCGAA	3594
1597	CGCTTCAC C TCTGCACG	1086	CGUGCAGA CUGAUGAG X CGAA IUGAAGCG	3595
1598	GCTTCACC T CTGCACGT	1087	ACGUGCAG CUGAUGAG X CGAA IGUGAAGC	3596
1600	TTCACCTC T GCACGTCG	1088	CGACGUGC CUGAUGAG X CGAA IAGGUGAA	3597
1603	ACCTCTGC A CGTCGCAT	1089	AUGCGACG CUGAUGAG X CGAA ICAGAGGU	3598
1610	CACGTCGC A TGGAGACC	1090	GGUCUCCA CUGAUGAG X CGAA ICGACGUG	3599
1618	ATGGAGAC C ACCGTGAA	1091	UUCACGGU CUGAUGAG X CGAA IUCUCCAU	3600
1619	TGGAGACC A CCGTGAAC	1092	GUUCACGG CUGAUGAG X CGAA IGUCUCCA	3601
1621	GAGACCAC C GTGAACGC	1093	GCGUUCAC CUGAUGAG X CGAA IUGGUCUC	3602
1630	GTGAACGC C CACAGGAA	1094	UUCCUGUG CUGAUGAG X CGAA ICGUUCAC	3603
1631	TGAACGCC C ACAGGAAC	1095	GUUCCUGU CUGAUGAG X CGAA IGCGUUCA	3604
1632	GAACGCCC A CAGGAACC	1096	GGUUCCUG CUGAUGAG X CGAA IGGCGUUC	3605
1634	ACGCCCAC A GGAACCTG	1097	CAGGUUCC CUGAUGAG X CGAA IUGGGCGU	3606
1640	ACAGGAAC C TGCCCAAG	1098	CUUGGGCA CUGAUGAG X CGAA IUUCCUGU	3607
1641	CAGGAACC T GCCCAAGG	1099	CCUUGGGC CUGAUGAG X CGAA IGUUCCUG	3608
1644	GAACCTGC C CAAGGTCT	1100	AGACCUUG CUGAUGAG X CGAA ICAGGUUC	3609
1645	AACCTGCC C AAGGTCTT	1101	AAGACCUU CUGAUGAG X CGAA IGCAGGUU	3610
1646	ACCTGCCC A AGGTCTTG	1102	CAAGACCU CUGAUGAG X CGAA IGGCAGGU	3611
1652	CCAAGGTC T TGCATAAG	1103	CUUAUGCA CUGAUGAG X CGAA IACCUUGG	3612
1656	GGTCTTGC A TAAGAGGA	1104	UCCUCUUA CUGAUGAG X CGAA ICAAGACC	3613
1666	AAGAGGAC T CTTGGACT	1105	AGUCCAAG CUGAUGAG X CGAA IUCCUCUU	3614

Table 38

1668	GAGGACTC T TGGACTTT	1106	AAAGUCCA CUGAUGAG X CGAA IAGUCCUC	3615
1674	TCTTGGAC T TTCAGCAA	1107	UUGCUGAA CUGAUGAG X CGAA IUCCAAGA	3616
1678	GGACTTTC A GCAATGTC	1108	GACAUUGC CUGAUGAG X CGAA IAAAGUCC	3617
1681	CTTTCAGC A ATGTCAAC	1109	GUUGACAU CUGAUGAG X CGAA ICUGAAAG	3618
1687	GCAATGTC A ACGACCGA	1110	UCGGUCGU CUGAUGAG X CGAA IACAUUGC	3619
1693	TCAACGAC C GACCTTGA	1111	UCAAGGUC CUGAUGAG X CGAA IUCGUUGA	3620
1697	CGACCGAC C TTGAGGCA	1112	UGCCUCAA CUGAUGAG X CGAA IUCGGUCG	3621
1698	GACCGACC T TGAGGCAT	1113	AUGCCUCA CUGAUGAG X CGAA IGUCGGUC	3622
1705	CTTGAGGC A TACTTCAA	1114	UUGAAGUA CUGAUGAG X CGAA ICCUCAAG	3623
1709	AGGCATAC T TCAAAGAC	1115	GUCUUUGA CUGAUGAG X CGAA IUAUGCCU	3624
1712	CATACTTC A AAGACTGT	1116	ACAGUCUU CUGAUGAG X CGAA IAAGUAUG	3625
1718	TCAAAGAC T GTGTGTTT	1117	AAACACAC CUGAUGAG X CGAA IUCUUUGA	3626
1769	TAAAGGTC T TTGTACTA	1118	UAGUACAA CUGAUGAG X CGAA IACCUUUA	3627
1776	CTTTGTAC T AGGAGGCT	1119	AGCCUCCU CUGAUGAG X CGAA IUACAAAG	3628
1784	TAGGAGGC T GTAGGCAT	1120	AUGCCUAC CUGAUGAG X CGAA ICCUCCUA	3629
1791	CTGTAGGC A TAAATTGG	1121	CCAAUUUA CUGAUGAG X CGAA ICCUACAG	3630
1807	GTGTGTTC A CCAGCACC	1122	GGUGCUGG CUGAUGAG X CGAA IAACACAC	3631
1809	GTGTTCAC C AGCACCAT	1123	AUGGUGCU CUGAUGAG X CGAA IUGAACAC	3632
1810	TGTTCACC A GCACCATG	1124	CAUGGUGC CUGAUGAG X CGAA IGUGAACA	3633
1813	TCACCAGC A CCATGCAA	1125	UUGCAUGG CUGAUGAG X CGAA ICUGGUGA	3634
1815	ACCAGCAC C ATGCAACT	1126	AGUUGCAU CUGAUGAG X CGAA IUGCUGGU	3635
1816	CCAGCACC A TGCAACTT	1127	AAGUUGCA CUGAUGAG X CGAA IGUGCUGG	3636
1820	CACCATGC A ACTTTTTC	1128	GAAAAAGU CUGAUGAG X CGAA ICAUGGUG	3637
1823	CATGCAAC T TTTTCACC	1129	GGUGAAAA CUGAUGAG X CGAA IUUGCAUG	3638
1829	ACTTTTTC A CCTCTGCC	1130	GGCAGAGG CUGAUGAG X CGAA IAAAAAGU	3639
1831	TTTTTCAC C TCTGCCTA	1131	UAGGCAGA CUGAUGAG X CGAA IUGAAAAA	3640
1832	TTTTCACC T CTGCCTAA	1132	UUAGGCAG CUGAUGAG X CGAA IGUGAAAA	3641
1834	TTCACCTC T GCCTAATC	1133	GAUUAGGC CUGAUGAG X CGAA IAGGUGAA	3642
1837	ACCTCTGC C TAATCATC	1134	GAUGAUUA CUGAUGAG X CGAA ICAGAGGU	3643
1838	CCTCTGCC T AATCATCT	1135	AGAUGAUU CUGAUGAG X CGAA IGCAGAGG	3644
1843	GCCTAATC A TCTCATGT	1136	ACAUGAGA CUGAUGAG X CGAA IAUUAGGC	3645
1846	TAATCATC T CATGTTCA	1137	UGAACAUG CUGAUGAG X CGAA IAUGAUUA	3646
1848	ATCATCTC A TGTTCATG	1138	CAUGAACA CUGAUGAG X CGAA IAGAUGAU	3647
1854	TCATGTTC A TGTCCTAC	1139	GUAGGACA CUGAUGAG X CGAA IAACAUGA	3648
1859	TTCATGTC C TACTGTTC	1140	GAACAGUA CUGAUGAG X CGAA IACAUGAA	3649
1860	TCATGTCC T ACTGTTCA	1141	UGAACAGU CUGAUGAG X CGAA IGACAUGA	3650
1863	TGTCCTAC T GTTCAAGC	1142	GCUUGAAC CUGAUGAG X CGAA IUAGGACA	3651
1868	TACTGTTC A AGCCTCCA	1143	UGGAGGCU CUGAUGAG X CGAA IAACAGUA	3652
1872	GTTCAAGC C TCCAAGCT	1144	AGCUUGGA CUGAUGAG X CGAA ICUUGAAC	3653
1873	TTCAAGCC T CCAAGCTG	1145	CAGCUUGG CUGAUGAG X CGAA IGCUUGAA	3654
1875	CAAGCCTC C AAGCTGTG	1146	CACAGCUU CUGAUGAG X CGAA IAGGCUUG	3655
1876	AAGCCTCC A AGCTGTGC	1147	GCACAGCU CUGAUGAG X CGAA IGAGGCUU	3656
1880	CTCCAAGC T GTGCCTTG	1148	CAAGGCAC CUGAUGAG X CGAA ICUUGGAG	3657
1885	AGCTGTGC C TTGGGTGG	1149	CCACCCAA CUGAUGAG X CGAA ICACAGCU	3658
1886	GCTGTGCC T TGGGTGGC	1150	GCCACCCA CUGAUGAG X CGAA IGCACAGC	3659
1895	TGGGTGGC T TTGGGGCA	1151	UGCCCCAA CUGAUGAG X CGAA ICCACCCA	3660
1903	TTTGGGGC A TGGACATT	1152	AAUGUCCA CUGAUGAG X CGAA ICCCCAAA	3661
1909	GCATGGAC A TTGACCCG	1153	CGGGUCAA CUGAUGAG X CGAA IUCCAUGC	3662
1915	ACATTGAC C CGTATAAA	1154	UUUAUACG CUGAUGAG X CGAA IUCAAUGU	3663
1916	CATTGACC C GTATAAAG	1155	CUUUAUAC CUGAUGAG X CGAA IGUCAAUG	3664
1935	TTTGGAGC T TCTGTGGA	1156	UCCACAGA CUGAUGAG X CGAA ICUCCAAA	3665

Table 38

1938	GGAGCTTC T GTGGAGTT	1157	AACUCCAC CUGAUGAG X CGAA IAAGCUCC	3666
1949	GGAGTTAC T CTCTTTTT	1158	AAAAAGAG CUGAUGAG X CGAA IUAACUCC	3667
1951	AGTTACTC T CTTTTTTG	1159	CAAAAAAG CUGAUGAG X CGAA IAGUAACU	3668
1953	TTACTCTC T TTTTTGCC	1160	GGCAAAAA CUGAUGAG X CGAA IAGAGUAA	3669
1961	TTTTTTGC C TTCTGACT	1161	AGUCAGAA CUGAUGAG X CGAA ICAAAAAA	3670
1962	TTTTTGCC T TCTGACTT	1162	AAGUCAGA CUGAUGAG X CGAA IGCAAAAA	3671
1965	TTGCCTTC T GACTTCTT	1163	AAGAAGUC CUGAUGAG X CGAA IAAGGCAA	3672
1969	CTTCTGAC T TCTTTCCT	1164	AGGAAAGA CUGAUGAG X CGAA IUCAGAAG	3673
1972	CTGACTTC T TTCCTTCT	1165	AGAAGGAA CUGAUGAG X CGAA IAAGUCAG	3674
1976	CTTCTTTC C TTCTATTC	1166	GAAUAGAA CUGAUGAG X CGAA IAAAGAAG	3675
1977	TTCTTTCC T TCTATTCG	1167	CGAAUAGA CUGAUGAG X CGAA IGAAAGAA	3676
1980	TTTCCTTC T ATTCGAGA	1168	UCUCGAAU CUGAUGAG X CGAA IAAGGAAA	3677
1991	TCGAGATC T CCTCGACA	1169	UGUCGAGG CUGAUGAG X CGAA IAUCUCGA	3678
1993	GAGATCTC C TCGACACC	1170	GGUGUCGA CUGAUGAG X CGAA IAGAUCUC	3679
1994	AGATCTCC T CGACACCG	1171	CGGUGUCG CUGAUGAG X CGAA IGAGAUCU	3680
1999	TCCTCGAC A CCGCCTCT	1172	AGAGGCGG CUGAUGAG X CGAA IUCGAGGA	3681
2001	CTCGACAC C GCCTCTGC	1173	GCAGAGGC CUGAUGAG X CGAA IUGUCGAG	3682
2004	GACACCGC C TCTGCTCT	1174	AGAGCAGA CUGAUGAG X CGAA ICGGUGUC	3683
2005	ACACCGCC T CTGCTCTG	1175	CAGAGCAG CUGAUGAG X CGAA IGCGGUGU	3684
2007	ACCGCCTC T GCTCTGTA	1176	UACAGAGC CUGAUGAG X CGAA IAGGCGGU	3685
2010	GCCTCTGC T CTGTATCG	1177	CGAUACAG CUGAUGAG X CGAA ICAGAGGC	3686
2012	CTCTGCTC T GTATCGGG	1178	CCCGAUAC CUGAUGAG X CGAA IAGCAGAG	3687
2025	CGGGGGGC C TTAGAGTC	1179	GACUCUAA CUGAUGAG X CGAA ICCCCCCG	3688
2026	GGGGGGCC T TAGAGTCT	1180	AGACUCUA CUGAUGAG X CGAA IGCCCCCC	3689
2034	TTAGAGTC T CCGGAACA	1181	UGUUCCGG CUGAUGAG X CGAA IACUCUAA	3690
2036	AGAGTCTC C GGAACATT	1182	AAUGUUCC CUGAUGAG X CGAA IAGACUCU	3691
2042	TCCGGAAC A TTGTTCAC	1183	GUGAACAA CUGAUGAG X CGAA IUUCCGGA	3692
2049	CATTGTTC A CCTCACCA	1184	UGGUGAGG CUGAUGAG X CGAA IAACAAUG	3693
2051	TTGTTCAC C TCACCATA	1185	UAUGGUGA CUGAUGAG X CGAA IUGAACAA	3694
2052	TGTTCACC T CACCATAC	1186	GUAUGGUG CUGAUGAG X CGAA IGUGAACA	3695
2054	TTCACCTC A CCATACGG	1187	CCGUAUGG CUGAUGAG X CGAA IAGGUGAA	3696
2056	CACCTCAC C ATACGGCA	1188	UGCCGUAU CUGAUGAG X CGAA IUGAGGUG	3697
2057	ACCTCACC A TACGGCAC	1189	GUGCCGUA CUGAUGAG X CGAA IGUGAGGU	3698
2064	CATACGGC A CTCAGGCA	1190	UGCCUGAG CUGAUGAG X CGAA ICCGUAUG	3699
2066	TACGGCAC T CAGGCAAG	1191	CUUGCCUG CUGAUGAG X CGAA IUGCCGUA	3700
2068	CGGCACTC A GGCAAGCT	1192	AGCUUGCC CUGAUGAG X CGAA IAGUGCCG	3701
2072	ACTCAGGC A AGCTATTC	1193	GAAUAGCU CUGAUGAG X CGAA ICCUGAGU	3702
2076	AGGCAAGC T ATTCTGTG	1194	CACAGAAU CUGAUGAG X CGAA ICUUGCCU	3703
2081	AGCTATTC T GTGTTGGG	1195	CCCAACAC CUGAUGAG X CGAA IAAUAGCU	3704
2105	GATGAATC T AGCCACCT	1196	AGGUGGCU CUGAUGAG X CGAA IAUUCAUC	3705
2109	AATCTAGC C ACCTGGGT	1197	ACCCAGGU CUGAUGAG X CGAA ICUAGAUU	3706
2110	ATCTAGCC A CCTGGGTG	1198	CACCCAGG CUGAUGAG X CGAA IGCUAGAU	3707
2112	CTAGCCAC C TGGGTGGG	1199	CCCACCCA CUGAUGAG X CGAA IUGGCUAG	3708
2113	TAGCCACC T GGGTGGGA	1200	UCCCACCC CUGAUGAG X CGAA IGUGGCUA	3709
2138	GGAAGATC C AGCATCCA	1201	UGGAUGCU CUGAUGAG X CGAA IAUCUUCC	3710
2139	GAAGATCC A GCATCCAG	1202	CUGGAUGC CUGAUGAG X CGAA IGAUCUUC	3711
2142	GATCCAGC A TCCAGGGA	1203	UCCCUGGA CUGAUGAG X CGAA ICUGGAUC	3712
2145	CCAGCATC C AGGGAATT	1204	AAUUCCCU CUGAUGAG X CGAA IAUGCUGG	3713
2146	CAGCATCC A GGGAATTA	1205	UAAUUCCC CUGAUGAG X CGAA IGAUGCUG	3714
2161	TAGTAGTC A GCTATGTC	1206	GACAUAGC CUGAUGAG X CGAA IACUACUA	3715
2164	TAGTCAGC T ATGTCAAC	1207	GUUGACAU CUGAUGAG X CGAA ICUGACUA	3716

Table 38

2170	GCTATGTC A ACGTTAAT	1208	AUUAACGU CUGAUGAG X CGAA IACAUAGC	3717
2185	ATATGGGC C TAAAAATC	1209	GAUUUUUA CUGAUGAG X CGAA ICCCAUAU	3718
2186	TATGGGCC T AAAAATCA	1210	UGAUUUUU CUGAUGAG X CGAA IGCCCAUA	3719
2194	TAAAAATC A GACAACTA	1211	UAGUUGUC CUGAUGAG X CGAA IAUUUUUA	3720
2198	AATCAGAC A ACTATTGT	1212	ACAAUAGU CUGAUGAG X CGAA IUCUGAUU	3721
2201	CAGACAAC T ATTGTGGT	1213	ACCACAAU CUGAUGAG X CGAA IUUGUCUG	3722
2213	GTGGTTTC A CATTTCCT	1214	AGGAAAUG CUGAUGAG X CGAA IAAACCAC	3723
2215	GGTTTCAC A TTTCCTGT	1215	ACAGGAAA CUGAUGAG X CGAA IUGAAACC	3724
2220	CACATTTC C TGTCTTAC	1216	GUAAGACA CUGAUGAG X CGAA IAAAUGUG	3725
2221	ACATTTCC T GTCTTACT	1217	AGUAAGAC CUGAUGAG X CGAA IGAAAUGU	3726
2225	TTCCTGTC T TACTTTTG	1218	CAAAAGUA CUGAUGAG X CGAA IACAGGAA	3727
2229	TGTCTTAC T TTTGGGCG	1219	CGCCCAAA CUGAUGAG X CGAA IUAAGACA	3728
2244	CGAGAAAC T GTTCTTGA	1220	UCAAGAAC CUGAUGAG X CGAA IUUUCUCG	3729
2249	AACTGTTC T TGAATATT	1221	AAUAUUCA CUGAUGAG X CGAA IAACAGUU	3730
2265	TTGGTGTC T TTTGGAGT	1222	ACUCCAAA CUGAUGAG X CGAA IACACCAA	3731
2284	GGATTCGC A CTCCTCCT	1223	AGGAGGAG CUGAUGAG X CGAA ICGAAUCC	3732
2286	ATTCGCAC T CCTCCTGC	1224	GCAGGAGG CUGAUGAG X CGAA IUGCGAAU	3733
2288	TCGCACTC C TCCTGCAT	1225	AUGCAGGA CUGAUGAG X CGAA IAGUGCGA	3734
2289	CGCACTCC T CCTGCATA	1226	UAUGCAGG CUGAUGAG X CGAA IGAGUGCG	3735
2291	CACTCCTC C TGCATATA	1227	UAUAUGCA CUGAUGAG X CGAA IAGGAGUG	3736
2292	ACTCCTCC T GCATATAG	1228	CUAUAUGC CUGAUGAG X CGAA IGAGGAGU	3737
2295	CCTCCTGC A TATAGACC	1229	GGUCUAUA CUGAUGAG X CGAA ICAGGAGG	3738
2303	ATATAGAC C ACCAAATG	1230	CAUUUGGU CUGAUGAG X CGAA IUCUAUAU	3739
2304	TATAGACC A CCAAATGC	1231	GCAUUUGG CUGAUGAG X CGAA IGUCUAUA	3740
2306	TAGACCAC C AAATGCCC	1232	GGGCAUUU CUGAUGAG X CGAA IUGGUCUA	3741
2307	AGACCACC A AATGCCCC	1233	GGGGCAUU CUGAUGAG X CGAA IGUGGUCU	3742
2313	CCAAATGC C CCTATCTT	1234	AAGAUAGG CUGAUGAG X CGAA ICAUUUGG	3743
2314	CAAATGCC C CTATCTTA	1235	UAAGAUAG CUGAUGAG X CGAA IGCAUUUG	3744
2315	AAATGCCC C TATCTTAT	1236	AUAAGAUA CUGAUGAG X CGAA IGGCAUUU	3745
2316	AATGCCCC T ATCTTATC	1237	GAUAAGAU CUGAUGAG X CGAA IGGGCAUU	3746
2320	CCCCTATC T TATCAACA	1238	UGUUGAUA CUGAUGAG X CGAA IAUAGGGG	3747
2325	ATCTTATC A ACACTTCC	1239	GGAAGUGU CUGAUGAG X CGAA IAUAAGAU	3748
2328	TTATCAAC A CTTCCGGA	1240	UCCGGAAG CUGAUGAG X CGAA IUUGAUAA	3749
2330	ATCAACAC T TCCGGAAA	1241	UUUCCGGA CUGAUGAG X CGAA IUGUUGAU	3750
2333	AACACTTC C GGAAACTA	1242	UAGUUUCC CUGAUGAG X CGAA IAAGUGUU	3751
2340	CCGGAAAC T ACTGTTGT	1243	ACAACAGU CUGAUGAG X CGAA IUUUCCGG	3752
2343	GAAACTAC T GTTGTTAG	1244	CUAACAAC CUGAUGAG X CGAA IUAGUUUC	3753
2362	GAAGAGGC A GGTCCCCT	1245	AGGGGACC CUGAUGAG X CGAA ICCUCUUC	3754
2367	GGCAGGTC C CCTAGAAG	1246	CUUCUAGG CUGAUGAG X CGAA IACCUGCC	3755
2368	GCAGGTCC C CTAGAAGA	1247	UCUUCUAG CUGAUGAG X CGAA IGACCUGC	3756
2369	CAGGTCCC C TAGAAGAA	1248	UUCUUCUA CUGAUGAG X CGAA IGGACCUG	3757
2370	AGGTCCCC T AGAAGAAG	1249	CUUCUUCU CUGAUGAG X CGAA IGGGACCU	3758
2382	AGAAGAAC T CCCTCGCC	1250	GGCGAGGG CUGAUGAG X CGAA IUUCUUCU	3759
2384	AAGAACTC C CTCGCCTC	1251	GAGGCGAG CUGAUGAG X CGAA IAGUUCUU	3760
2385	AGAACTCC C TCGCCTCG	1252	CGAGGCGA CUGAUGAG X CGAA IGAGUUCU	3761
2386	GAACTCCC T CGCCTCGC	1253	GCGAGGCG CUGAUGAG X CGAA IGGAGUUC	3762
2390	TCCCTCGC C TCGCAGAC	1254	GUCUGCGA CUGAUGAG X CGAA ICGAGGGA	3763
2391	CCCTCGCC T CGCAGACG	1255	CGUCUGCG CUGAUGAG X CGAA IGCGAGGG	3764
2395	CGCCTCGC A GACGAAGG	1256	CCUUCGUC CUGAUGAG X CGAA ICGAGGCG	3765
2406	CGAAGGTC T CAATCGCC	1257	GGCGAUUG CUGAUGAG X CGAA IACCUUCG	3766
2408	AAGGTCTC A ATCGCCGC	1258	GCGGCGAU CUGAUGAG X CGAA IAGACCUU	3767

Table 38

2414	TCAATCGC C GCGTCGCA	1259	UGCGACGC CUGAUGAG X CGAA ICGAUUGA	3768
2422	CGCGTCGC A GAAGATCT	1260	AGAUCUUC CUGAUGAG X CGAA ICGACGCG	3769
2430	AGAAGATC T CAATCTCG	1261	CGAGAUUG CUGAUGAG X CGAA IAUCUUCU	3770
2432	AAGATCTC A ATCTCGGG	1262	CCCGAGAU CUGAUGAG X CGAA IAGAUCUU	3771
2436	TCTCAATC T CGGGAATC	1263	GAUUCCCG CUGAUGAG X CGAA IAUUGAGA	3772
2445	CGGGAATC T CAATGTTA	1264	UAACAUUG CUGAUGAG X CGAA IAUUCCCG	3773
2447	GGAATCTC A ATGTTAGT	1265	ACUAACAU CUGAUGAG X CGAA IAGAUUCC	3774
2460	TAGTATTC C TTGGACAC	1266	GUGUCCAA CUGAUGAG X CGAA IAAUACUA	3775
2461	AGTATTCC T TGGACACA	1267	UGUGUCCA CUGAUGAG X CGAA IGAAUACU	3776
2467	CCTTGGAC A CATAAGGT	1268	ACCUUAUG CUGAUGAG X CGAA IUCCAAGG	3777
2469	TTGGACAC A TAAGGTGG	1269	CCACCUUA CUGAUGAG X CGAA IUGUCCAA	3778
2483	TGGGAAAC T TTACGGGG	1270	CCCCGUAA CUGAUGAG X CGAA IUUUCCCA	3779
2493	TACGGGGC T TTATTCTT	1271	AAGAAUAA CUGAUGAG X CGAA ICCCCGUA	3780
2500	CTTTATTC T TCTACGGT	1272	ACCGUAGA CUGAUGAG X CGAA IAAUAAAG	3781
2503	TATTCTTC T ACGGTACC	1273	GGUACCGU CUGAUGAG X CGAA IAAGAAUA	3782
2511	TACGGTAC C TTGCTTTA	1274	UAAAGCAA CUGAUGAG X CGAA IUACCGUA	3783
2512	ACGGTACC T TGCTTTAA	1275	UUAAAGCA CUGAUGAG X CGAA IGUACCGU	3784
2516	TACCTTGC T TTAATCCT	1276	AGGAUUAA CUGAUGAG X CGAA ICAAGGUA	3785
2523	CTTTAATC C TAAATGGC	1277	GCCAUUUA CUGAUGAG X CGAA IAUUAAAG	3786
2524	TTTAATCC T AAATGGCA	1278	UGCCAUUU CUGAUGAG X CGAA IGAUUAAA	3787
2532	TAAATGGC A AACTCCTT	1279	AAGGAGUU CUGAUGAG X CGAA ICCAUUUA	3788
2536	TGGCAAAC T CCTTCTTT	1280	AAAGAAGG CUGAUGAG X CGAA IUUUGCCA	3789
2538	GCAAACTC C TTCTTTTC	1281	GAAAAGAA CUGAUGAG X CGAA IAGUUUGC	3790
2539	CAAACTCC T TCTTTTCC	1282	GGAAAAGA CUGAUGAG X CGAA IGAGUUUG	3791
2542	ACTCCTTC T TTTCCTGA	1283	UCAGGAAA CUGAUGAG X CGAA IAAGGAGU	3792
2547	TTCTTTTC C TGACATTC	1284	GAAUGUCA CUGAUGAG X CGAA IAAAAGAA	3793
2548	TCTTTTCC T GACATTCA	1285	UGAAUGUC CUGAUGAG X CGAA IGAAAAGA	3794
2552	TTCCTGAC A TTCATTTG	1286	CAAAUGAA CUGAUGAG X CGAA IUCAGGAA	3795
2556	TGACATTC A TTTGCAGG	1287	CCUGCAAA CUGAUGAG X CGAA IAAUGUCA	3796
2562	TCATTTGC A GGAGGACA	1288	UGUCCUCC CUGAUGAG X CGAA ICAAAUGA	3797
2570	AGGAGGAC A TTGTTGAT	1289	AUCAACAA CUGAUGAG X CGAA IUCCUCCU	3798
2589	ATGTAAGC A ATTTGTGG	1290	CCACAAAU CUGAUGAG X CGAA ICUUACAU	3799
2601	TGTGGGGC C CCTTACAG	1291	CUGUAAGG CUGAUGAG X CGAA ICCCCACA	3800
2602	GTGGGGCC C CTTACAGT	1292	ACUGUAAG CUGAUGAG X CGAA IGCCCCAC	3801
2603	TGGGGCCC C TTACAGTA	1293	UACUGUAA CUGAUGAG X CGAA IGGCCCCA	3802
2604	GGGGCCCC T TACAGTAA	1294	UUACUGUA CUGAUGAG X CGAA IGGGCCCC	3803
2608	CCCCTTAC A GTAAATGA	1295	UCAUUUAC CUGAUGAG X CGAA IUAAGGGG	3804
2621	ATGAAAAC A GGAGACTT	1296	AAGUCUCC CUGAUGAG X CGAA IUUUUCAU	3805
2628	CAGGAGAC T TAAATTAA	1297	UUAAUUUA CUGAUGAG X CGAA IUCUCCUG	3806
2638	AAATTAAC T ATGCCTGC	1298	GCAGGCAU CUGAUGAG X CGAA IUUAAUUU	3807
2643	AACTATGC C TGCTAGGT	1299	ACCUAGCA CUGAUGAG X CGAA ICAUAGUU	3808
2644	ACTATGCC T GCTAGGTT	1300	AACCUAGC CUGAUGAG X CGAA IGCAUAGU	3809
2647	ATGCCTGC T AGGTTTTA	1301	UAAAACCU CUGAUGAG X CGAA ICAGGCAU	3810
2658	GTTTTATC C CAATGTTA	1302	UAACAUUG CUGAUGAG X CGAA IAUAAAAC	3811
2659	TTTTATCC C AATGTTAC	1303	GUAACAUU CUGAUGAG X CGAA IGAUAAAA	3812
2660	TTTATCCC A ATGTTACT	1304	AGUAACAU CUGAUGAG X CGAA IGGAUAAA	3813
2668	AATGTTAC T AAATATTT	1305	AAAUAUUU CUGAUGAG X CGAA IUAACAUU	3814
2679	ATATTTGC C CTTAGATA	1306	UAUCUAAG CUGAUGAG X CGAA ICAAAUAU	3815
2680	TATTTGCC C TTAGATAA	1307	UUAUCUAA CUGAUGAG X CGAA IGCAAAUA	3816
2681	ATTTGCCC T TAGATAAA	1308	UUUAUCUA CUGAUGAG X CGAA IGGCAAAU	3817
2696	AAGGGATC A AACCGTAT	1309	AUACGGUU CUGAUGAG X CGAA IAUCCCUU	3818

Table 38

2700	GATCAAAC C GTATTATC	1310	GAUAAUAC CUGAUGAG X CGAA IUUUGAUC	3819
2709	GTATTATC C AGAGTATG	1311	CAUACUCU CUGAUGAG X CGAA IAUAAUAC	3820
2710	TATTATCC A GAGTATGT	1312	ACAUACUC CUGAUGAG X CGAA IGAUAAUA	3821
2727	AGTTAATC A TTACTTCC	1313	GGAAGUAA CUGAUGAG X CGAA IAUUAACU	3822
2732	ATCATTAC T TCCAGACG	1314	CGUCUGGA CUGAUGAG X CGAA IUAAUGAU	3823
2735	ATTACTTC C AGACGCGA	1315	UCGCGUCU CUGAUGAG X CGAA IAAGUAAU	3824
2736	TTACTTCC A GACGCGAC	1316	GUCGCGUC CUGAUGAG X CGAA IGAAGUAA	3825
2745	GACGCGAC A TTATTTAC	1317	GUAAAUAA CUGAUGAG X CGAA IUCGCGUC	3826
2754	TTATTTAC A CACTCTTT	1318	AAAGAGUG CUGAUGAG X CGAA IUAAAUAA	3827
2756	ATTTACAC A CTCTTTGG	1319	CCAAAGAG CUGAUGAG X CGAA IUGUAAAU	3828
2758	TTACACAC T CTTTGGAA	1320	UUCCAAAG CUGAUGAG X CGAA IUGUGUAA	3829
2760	ACACACTC T TTGGAAGG	1321	CCUUCCAA CUGAUGAG X CGAA IAGUGUGU	3830
2777	CGGGGATC T TATATAAA	1322	UUUAUAUA CUGAUGAG X CGAA IAUCCCCG	3831
2794	AGAGAGTC C ACACGTAG	1323	CUACGUGU CUGAUGAG X CGAA IACUCUCU	3832
2795	GAGAGTCC A CACGTAGC	1324	GCUACGUG CUGAUGAG X CGAA IGACUCUC	3833
2797	GAGTCCAC A CGTAGCGC	1325	GCGCUACG CUGAUGAG X CGAA IUGGACUC	3834
2806	CGTAGCGC C TCATTTTG	1326	CAAAAUGA CUGAUGAG X CGAA ICGCUACG	3835
2807	GTAGCGCC T CATTTTGC	1327	GCAAAAUG CUGAUGAG X CGAA IGCGCUAC	3836
2809	AGCGCCTC A TTTTGCGG	1328	CCGCAAAA CUGAUGAG X CGAA IAGGCGCU	3837
2821	TGCGGGTC A CCATATTC	1329	GAAUAUGG CUGAUGAG X CGAA IACCCGCA	3838
2823	CGGGTCAC C ATATTCTT	1330	AAGAAUAU CUGAUGAG X CGAA IUGACCCG	3839
2824	GGGTCACC A TATTCTTG	1331	CAAGAAUA CUGAUGAG X CGAA IGUGACCC	3840
2830	CCATATTC T TGGGAACA	1332	UGUUCCCA CUGAUGAG X CGAA IAAUAUGG	3841
2838	TTGGGAAC A AGATCTAC	1333	GUAGAUCU CUGAUGAG X CGAA IUUCCCAA	3842
2844	ACAAGATC T ACAGCATG	1334	CAUGCUGU CUGAUGAG X CGAA IAUCUUGU	3843
2847	AGATCTAC A GCATGGGA	1335	UCCCAUGC CUGAUGAG X CGAA IUAGAUCU	3844
2850	TCTACAGC A TGGGAGGT	1336	ACCUCCCA CUGAUGAG X CGAA ICUGUAGA	3845
2864	GGTTGGTC T TCCAAACC	1337	GGUUUGGA CUGAUGAG X CGAA IACCAACC	3846
2867	TGGTCTTC C AAACCTCG	1338	CGAGGUUU CUGAUGAG X CGAA IAAGACCA	3847
2868	GGTCTTCC A AACCTCGA	1339	UCGAGGUU CUGAUGAG X CGAA IGAAGACC	3848
2872	TTCCAAAC C TCGAAAAG	1340	CUUUUCGA CUGAUGAG X CGAA IUUUGGAA	3849
2873	TCCAAACC T CGAAAAGG	1341	CCUUUUCG CUGAUGAG X CGAA IGUUUGGA	3850
2883	GAAAAGGC A TGGGGACA	1342	UGUCCCCA CUGAUGAG X CGAA ICCUUUUC	3851
2891	ATGGGGAC A AATCTTTC	1343	GAAAGAUU CUGAUGAG X CGAA IUCCCCAU	3852
2896	GACAAATC T TTCTGTCC	1344	GGACAGAA CUGAUGAG X CGAA IAUUUGUC	3853
2900	AATCTTTC T GTCCCCAA	1345	UUGGGGAC CUGAUGAG X CGAA IAAAGAUU	3854
2904	TTTCTGTC C CCAATCCC	1346	GGGAUUGG CUGAUGAG X CGAA IACAGAAA	3855
2905	TTCTGTCC C CAATCCCC	1347	GGGGAUUG CUGAUGAG X CGAA IGACAGAA	3856
2906	TCTGTCCC C AATCCCCT	1348	AGGGGAUU CUGAUGAG X CGAA IGGACAGA	3857
2907	CTGTCCCC A ATCCCCTG	1349	CAGGGGAU CUGAUGAG X CGAA IGGGACAG	3858
2911	CCCCAATC C CCTGGGAT	1350	AUCCCAGG CUGAUGAG X CGAA IAUUGGGG	3859
2912	CCCAATCC C CTGGGATT	1351	AAUCCCAG CUGAUGAG X CGAA IGAUUGGG	3860
2913	CCAATCCC C TGGGATTC	1352	GAAUCCCA CUGAUGAG X CGAA IGGAUUGG	3861
2914	CAATCCCC T GGGATTCT	1353	AGAAUCCC CUGAUGAG X CGAA IGGGAUUG	3862
2922	TGGGATTC T TCCCCGAT	1354	AUCGGGGA CUGAUGAG X CGAA IAAUCCCA	3863
2925	GATTCTTC C CCGATCAT	1355	AUGAUCGG CUGAUGAG X CGAA IAAGAAUC	3864
2926	ATTCTTCC C CGATCATC	1356	GAUGAUCG CUGAUGAG X CGAA IGAAGAAU	3865
2927	TTCTTCCC C GATCATCA	1357	UGAUGAUC CUGAUGAG X CGAA IGGAAGAA	3866
2932	CCCCGATC A TCAGTTGG	1358	CCAACUGA CUGAUGAG X CGAA IAUCGGGG	3867
2935	CGATCATC A GTTGGACC	1359	GGUCCAAC CUGAUGAG X CGAA IAUGAUCG	3868
2943	AGTTGGAC C CTGCATTC	1360	GAAUGCAG CUGAUGAG X CGAA IUCCAACU	3869

Table 38

2944	GTTGGACC C TGCATTCA	1361	UGAAUGCA CUGAUGAG X CGAA IGUCCAAC	3870
2945	TTGGACCC T GCATTCAA	1362	UUGAAUGC CUGAUGAG X CGAA IGGUCCAA	3871
2948	GACCCTGC A TTCAAAGC	1363	GCUUUGAA CUGAUGAG X CGAA ICAGGGUC	3872
2952	CTGCATTC A AAGCCAAC	1364	GUUGGCUU CUGAUGAG X CGAA IAAUGCAG	3873
2957	TTCAAAGC C AACTCAGT	1365	ACUGAGUU CUGAUGAG X CGAA ICUUUGAA	3874
2958	TCAAAGCC A ACTCAGTA	1366	UACUGAGU CUGAUGAG X CGAA IGCUUUGA	3875
2961	AAGCCAAC T CAGTAAAT	1367	AUUUACUG CUGAUGAG X CGAA IUUGGCUU	3876
2963	GCCAACTC A GTAAATCC	1368	GGAUUUAC CUGAUGAG X CGAA IAGUUGGC	3877
2971	AGTAAATC C AGATTGGG	1369	CCCAAUCU CUGAUGAG X CGAA IAUUUACU	3878
2972	GTAAATCC A GATTGGGA	1370	UCCCAAUC CUGAUGAG X CGAA IGAUUUAC	3879
2982	ATTGGGAC C TCAACCCG	1371	CGGGUUGA CUGAUGAG X CGAA IUCCCAAU	3880
2983	TTGGGACC T CAACCCGC	1372	GCGGGUUG CUGAUGAG X CGAA IGUCCCAA	3881
2985	GGGACCTC A ACCCGCAC	1373	GUGCGGGU CUGAUGAG X CGAA IAGGUCCC	3882
2988	ACCTCAAC C CGCACAAG	1374	CUUGUGCG CUGAUGAG X CGAA IUUGAGGU	3883
2989	CCTCAACC C GCACAAGG	1375	CCUUGUGC CUGAUGAG X CGAA IGUUGAGG	3884
2992	CAACCCGC A CAAGGACA	1376	UGUCCUUG CUGAUGAG X CGAA ICGGGUUG	3885
2994	ACCCGCAC A AGGACAAC	1377	GUUGUCCU CUGAUGAG X CGAA IUGCGGGU	3886
3000	ACAAGGAC A ACTGGCCG	1378	CGGCCAGU CUGAUGAG X CGAA IUCCUUGU	3887
3003	AGGACAAC T GGCCGGAC	1379	GUCCGGCC CUGAUGAG X CGAA IUUGUCCU	3888
3007	CAACTGGC C GGACGCCA	1380	UGGCGUCC CUGAUGAG X CGAA ICCAGUUG	3889
3014	CCGGACGC C AACAAGGT	1381	ACCUUGUU CUGAUGAG X CGAA ICGUCCGG	3890
3015	CGGACGCC A ACAAGGTG	1382	CACCUUGU CUGAUGAG X CGAA IGCGUCCG	3891
3018	ACGCCAAC A AGGTGGGA	1383	UCCCACCU CUGAUGAG X CGAA IUUGGCGU	3892
3035	GTGGGAGC A TTCGGGCC	1384	GGCCCGAA CUGAUGAG X CGAA ICUCCCAC	3893
3043	ATTCGGGC C AGGGTTCA	1385	UGAACCCU CUGAUGAG X CGAA ICCCGAAU	3894
3044	TTCGGGCC A GGGTTCAC	1386	GUGAACCC CUGAUGAG X CGAA IGCCCGAA	3895
3051	CAGGGTTC A CCCCTCCC	1387	GGGAGGGG CUGAUGAG X CGAA IAACCCUG	3896
3053	GGGTTCAC C CCTCCCCA	1388	UGGGGAGG CUGAUGAG X CGAA IUGAACCC	3897
3054	GGTTCACC C CTCCCCAT	1389	AUGGGGAG CUGAUGAG X CGAA IGUGAACC	3898
3055	GTTCACCC C TCCCCATG	1390	CAUGGGGA CUGAUGAG X CGAA IGGUGAAC	3899
3056	TTCACCCC T CCCCATGG	1391	CCAUGGGG CUGAUGAG X CGAA IGGGUGAA	3900
3058	CACCCCTC C CCATGGGG	1392	CCCCAUGG CUGAUGAG X CGAA IAGGGGUG	3901
3059	ACCCCTCC C CATGGGGG	1393	CCCCCAUG CUGAUGAG X CGAA IGAGGGGU	3902
3060	CCCCTCCC C ATGGGGGA	1394	UCCCCCAU CUGAUGAG X CGAA IGGAGGGG	3903
3061	CCCTCCCC A TGGGGGAC	1395	GUCCCCCA CUGAUGAG X CGAA IGGGAGGG	3904
3070	TGGGGGAC T GTTGGGGT	1396	ACCCCAAC CUGAUGAG X CGAA IUCCCCCA	3905
3084	GGTGGAGC C CTCACGCT	1397	AGCGUGAG CUGAUGAG X CGAA ICUCCACC	3906
3085	GTGGAGCC C TCACGCTC	1398	GAGCGUGA CUGAUGAG X CGAA IGCUCCAC	3907
3086	TGGAGCCC T CACGCTCA	1399	UGAGCGUG CUGAUGAG X CGAA IGGCUCCA	3908
3088	GAGCCCTC A CGCTCAGG	1400	CCUGAGCG CUGAUGAG X CGAA IAGGGCUC	3909
3092	CCTCACGC T CAGGGCCT	1401	AGGCCCUG CUGAUGAG X CGAA ICGUGAGG	3910
3094	TCACGCTC A GGGCCTAC	1402	GUAGGCCC CUGAUGAG X CGAA IAGCGUGA	3911
3099	CTCAGGGC C TACTCACA	1403	UGUGAGUA CUGAUGAG X CGAA ICCCUGAG	3912
3100	TCAGGGCC T ACTCACAA	1404	UUGUGAGU CUGAUGAG X CGAA IGCCCUGA	3913
3103	GGGCCTAC T CACAACTG	1405	CAGUUGUG CUGAUGAG X CGAA IUAGGCCC	3914
3105	GCCTACTC A CAACTGTG	1406	CACAGUUG CUGAUGAG X CGAA IAGUAGGC	3915
3107	CTACTCAC A ACTGTGCC	1407	GGCACAGU CUGAUGAG X CGAA IUGAGUAG	3916
3110	CTCACAAC T GTGCCAGC	1408	GCUGGCAC CUGAUGAG X CGAA IUUGUGAG	3917
3115	AACTGTGC C AGCAGCTC	1409	GAGCUGCU CUGAUGAG X CGAA ICACAGUU	3918
3116	ACTGTGCC A GCAGCTCC	1410	GGAGCUGC CUGAUGAG X CGAA IGCACAGU	3919
3119	GTGCCAGC A GCTCCTCC	1411	GGAGGAGC CUGAUGAG X CGAA ICUGGCAC	3920

Table 38

3122	CCAGCAGC T CCTCCTCC	1412	GGAGGAGG CUGAUGAG X CGAA ICUGCUGG	3921
3124	AGCAGCTC C TCCTCCTG	1413	CAGGAGGA CUGAUGAG X CGAA IAGCUGCU	3922
3125	GCAGCTCC T CCTCCTGC	1414	GCAGGAGG CUGAUGAG X CGAA IGAGCUGC	3923
3127	AGCTCCTC C TCCTGCCT	1415	AGGCAGGA CUGAUGAG X CGAA IAGGAGCU	3924
3128	GCTCCTCC T CCTGCCTC	1416	GAGGCAGG CUGAUGAG X CGAA IGAGGAGC	3925
3130	TCCTCCTC C TGCCTCCA	1417	UGGAGGCA CUGAUGAG X CGAA IAGGAGGA	3926
3131	CCTCCTCC T GCCTCCAC	1418	GUGGAGGC CUGAUGAG X CGAA IGAGGAGG	3927
3134	CCTCCTGC C TCCACCAA	1419	UUGGUGGA CUGAUGAG X CGAA ICAGGAGG	3928
3135	CTCCTGCC T CCACCAAT	1420	AUUGGUGG CUGAUGAG X CGAA IGCAGGAG	3929
3137	CCTGCCTC C ACCAATCG	1421	CGAUUGGU CUGAUGAG X CGAA IAGGCAGG	3930
3138	CTGCCTCC A CCAATCGG	1422	CCGAUUGG CUGAUGAG X CGAA IGAGGCAG	3931
3140	GCCTCCAC C AATCGGCA	1423	UGCCGAUU CUGAUGAG X CGAA IUGGAGGC	3932
3141	CCTCCACC A ATCGGCAG	1424	CUGCCGAU CUGAUGAG X CGAA IGUGGAGG	3933
3148	CAATCGGC A GTCAGGAA	1425	UUCCUGAC CUGAUGAG X CGAA ICCGAUUG	3934
3152	CGGCAGTC A GGAAGGCA	1426	UGCCUUCC CUGAUGAG X CGAA IACUGCCG	3935
3160	AGGAAGGC A GCCTACTC	1427	GAGUAGGC CUGAUGAG X CGAA ICCUUCCU	3936
3163	AAGGCAGC C TACTCCCT	1428	AGGGAGUA CUGAUGAG X CGAA ICUGCCUU	3937
3164	AGGCAGCC T ACTCCCTT	1429	AAGGGAGU CUGAUGAG X CGAA IGCUGCCU	3938
3167	CAGCCTAC T CCCTTATC	1430	GAUAAGGG CUGAUGAG X CGAA IUAGGCUG	3939
3169	GCCTACTC C CTTATCTC	1431	GAGAUAAG CUGAUGAG X CGAA IAGUAGGC	3940
3170	CCTACTCC C TTATCTCC	1432	GGAGAUAA CUGAUGAG X CGAA IGAGUAGG	3941
3171	CTACTCCC T TATCTCCA	1433	UGGAGAUA CUGAUGAG X CGAA IGGAGUAG	3942
3176	CCCTTATC T CCACCTCT	1434	AGAGGUGG CUGAUGAG X CGAA IAUAAGGG	3943
3178	CTTATCTC C ACCTCTAA	1435	UUAGAGGU CUGAUGAG X CGAA IAGAUAAG	3944
3179	TTATCTCC A CCTCTAAG	1436	CUUAGAGG CUGAUGAG X CGAA IGAGAUAA	3945
3181	ATCTCCAC C TCTAAGGG	1437	CCCUUAGA CUGAUGAG X CGAA IUGGAGAU	3946
3182	TCTCCACC T CTAAGGGA	1438	UCCCUUAG CUGAUGAG X CGAA IGUGGAGA	3947
3184	TCCACCTC T AAGGGACA	1439	UGUCCCUU CUGAUGAG X CGAA IAGGUGGA	3948
3192	TAAGGGAC A CTCATCCT	1440	AGGAUGAG CUGAUGAG X CGAA IUCCCUUA	3949
3194	AGGGACAC T CATCCTCA	1441	UGAGGAUG CUGAUGAG X CGAA IUGUCCCU	3950
3196	GGACACTC A TCCTCAGG	1442	CCUGAGGA CUGAUGAG X CGAA IAGUGUCC	3951
3199	CACTCATC C TCAGGCCA	1443	UGGCCUGA CUGAUGAG X CGAA IAUGAGUG	3952
3200	ACTCATCC T CAGGCCAT	1444	AUGGCCUG CUGAUGAG X CGAA IGAUGAGU	3953
3202	TCATCCTC A GGCCATGC	1445	GCAUGGCC CUGAUGAG X CGAA IAGGAUGA	3954
3206	CCTCAGGC C ATGCAGTG	1446	CACUGCAU CUGAUGAG X CGAA ICCUGAGG	3955
3207	CTCAGGCC A TGCAGTGG	1447	CCACUGCA CUGAUGAG X CGAA IGCCUGAG	3956

Input Sequence = AF100308. Cut Site = CH/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
AF100308 (Hepatitis B virus strain 2-18, 3215 bp)

Table 39

Table 39: Human HBV G-cleaver Ribozyme and Substrate Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
61	ACUUUCCU G CUGGUGGC	1448	GCCACCAG UGAUG GCAUGCACUAUGC GCG AGGAAAGU	3957
87	GGAACAGU G AGCCCUGC	1449	GCAGGGCU UGAUG GCAUGCACUAUGC GCG ACUGUUCC	3958
94	UGAGCCCU G CUCAGAAU	1450	AUUCUGAG UGAUG GCAUGCACUAUGC GCG AGGGCUCA	3959
112	CUGUCUCU G CCAUAUCG	1451	CGAUAUGG UGAUG GCAUGCACUAUGC GCG AGAGACAG	3960
132	AUCUUAUC G AAGACUGG	1452	CCAGUCUU UGAUG GCAUGCACUAUGC GCG GAUAAGAU	3961
153	CCUGUACC G AACAUGGA	1453	UCCAUGUU UGAUG GCAUGCACUAUGC GCG GGUACAGG	3962
169	AGAACAUC G CAUCAGGA	1454	UCCUGAUG UGAUG GCAUGCACUAUGC GCG GAUGUUCU	3963
192	GGACCCCU G CUCGUGUU	1455	AACACGAG UGAUG GCAUGCACUAUGC GCG AGGGGUCC	3964
222	UUCUUGUU G ACAAAAAU	1456	AUUUUUGU UGAUG GCAUGCACUAUGC GCG AACAAGAA	3965
315	CAAAAUUC G CAGUCCCA	1457	UGGGACUG UGAUG GCAUGCACUAUGC GCG GAAUUUUG	3966
374	UGGUUAUC G CUGGAUGU	1458	ACAUCCAG UGAUG GCAUGCACUAUGC GCG GAUAACCA	3967
387	AUGUGUCU G CGGCGUUU	1459	AAACGCCG UGAUG GCAUGCACUAUGC GCG AGACACAU	3968
410	CUUCCUCU G CAUCCUGC	1460	GCAGGAUG UGAUG GCAUGCACUAUGC GCG AGAGGAAG	3969
417	UGCAUCCU G CUGCUAUG	1461	CAUAGCAG UGAUG GCAUGCACUAUGC GCG AGGAUGCA	3970
420	AUCCUGCU G CUAUGCCU	1462	AGGCAUAG UGAUG GCAUGCACUAUGC GCG AGCAGGAU	3971
425	GCUGCUAU G CCUCAUCU	1463	AGAUGAGG UGAUG GCAUGCACUAUGC GCG AUAGCAGC	3972
468	GGUAUGUU G CCCGUUUG	1464	CAAACGGG UGAUG GCAUGCACUAUGC GCG AACAUACC	3973
518	CGGACCAU G CAAAACCU	1465	AGGUUUUG UGAUG GCAUGCACUAUGC GCG AUGGUCCG	3974
527	CAAAACCU G CACAACUC	1466	GAGUUGUG UGAUG GCAUGCACUAUGC GCG AGGUUUUG	3975
538	CAACUCCU G CUCAAGGA	1467	UCCUUGAG UGAUG GCAUGCACUAUGC GCG AGGAGUUG	3976
569	CUCAUGUU G CUGUACAA	1468	UUGUACAG UGAUG GCAUGCACUAUGC GCG AACAUGAG	3977
596	CGGAAACU G CACCUGUA	1469	UACAGGUG UGAUG GCAUGCACUAUGC GCG AGUUUCCG	3978
631	GGGCUUUC G CAAAAUAC	1470	GUAUUUUG UGAUG GCAUGCACUAUGC GCG GAAAGCCC	3979
687	UUACUAGU G CCAUUUGU	1471	ACAAAUGG UGAUG GCAUGCACUAUGC GCG ACUAGUAA	3980
747	AUAUGGAU G AUGUGGUU	1472	AACCACAU UGAUG GCAUGCACUAUGC GCG AUCCAUAU	3981
783	AACAUCUU G AGUCCCUU	1473	AAGGGACU UGAUG GCAUGCACUAUGC GCG AAGAUGUU	3982
795	CCCUUUAU G CCGCUGUU	1474	AACAGCGG UGAUG GCAUGCACUAUGC GCG AUAAAGGG	3983
798	UUUAUGCC G CUGUUACC	1475	GGUAACAG UGAUG GCAUGCACUAUGC GCG GGCAUAAA	3984
911	GGCACAUU G CCACAGGA	1476	UCCUGUGG UGAUG GCAUGCACUAUGC GCG AAUGUGCC	3985
978	GGCCUAUU G AUUGGAAA	1477	UUUCCAAU UGAUG GCAUGCACUAUGC GCG AAUAGGCC	3986

Table 39

997	AUGUCAAC G AAUUGUGG	1478	CCACAAUU UGAUG GCAUGCACUAUGC GCG GUUGACAU	3987
1020	UGGGGUUU G CCGCCCCU	1479	AGGGGCGG UGAUG GCAUGCACUAUGC GCG AAACCCCA	3988
1023	GGUUUGCC G CCCCUUUC	1480	GAAAGGGG UGAUG GCAUGCACUAUGC GCG GGCAAACC	3989
1034	CCUUUCAC G CAAUGUGG	1481	CCACAUUG UGAUG GCAUGCACUAUGC GCG GUGAAAGG	3990
1050	GAUAUUCU G CUUUAAUG	1482	CAUUAAAG UGAUG GCAUGCACUAUGC GCG AGAAUAUC	3991
1058	GCUUUAAU G CCUUUAUA	1483	UAUAAAGG UGAUG GCAUGCACUAUGC GCG AUUAAAGC	3992
1068	CUUUAUAU G CAUGCAUA	1484	UAUGCAUG UGAUG GCAUGCACUAUGC GCG AUAUAAAG	3993
1072	AUAUGCAU G CAUACAAG	1485	CUUGUAUG UGAUG GCAUGCACUAUGC GCG AUGCAUAU	3994
1103	ACUUUCUC G CCAACUUA	1486	UAAGUUGG UGAUG GCAUGCACUAUGC GCG GAGAAAGU	3995
1139	CAGUAUGU G AACCUUUA	1487	UAAAGGUU UGAUG GCAUGCACUAUGC GCG ACAUACUG	3996
1155	ACCCCGUU G CUCGGCAA	1488	UUGCCGAG UGAUG GCAUGCACUAUGC GCG AACGGGGU	3997
1177	UGGUCUAU G CCAAGUGU	1489	ACACUUGG UGAUG GCAUGCACUAUGC GCG AUAGACCA	3998
1188	AAGUGUUU G CUGACGCA	1490	UGCGUCAG UGAUG GCAUGCACUAUGC GCG AAACACUU	3999
1191	UGUUUGCU G ACGCAACC	1491	GGUUGCGU UGAUG GCAUGCACUAUGC GCG AGCAAACA	4000
1194	UUGCUGAC G CAACCCCC	1492	GGGGGUUG UGAUG GCAUGCACUAUGC GCG GUCAGCAA	4001
1234	CCAUCAGC G CAUGCGUG	1493	CACGCAUG UGAUG GCAUGCACUAUGC GCG GCUGAUGG	4002
1238	CAGCGCAU G CGUGGAAC	1494	GUUCCACG UGAUG GCAUGCACUAUGC GCG AUGCGCUG	4003
1262	UCUCCUCU G CCGAUCCA	1495	UGGAUCGG UGAUG GCAUGCACUAUGC GCG AGAGGAGA	4004
1265	CCUCUGCC G AUCCAUAC	1496	GUAUGGAU UGAUG GCAUGCACUAUGC GCG GGCAGAGG	4005
1275	UCCAUACC G CGGAACUC	1497	GAGUUCCG UGAUG GCAUGCACUAUGC GCG GGUAUGGA	4006
1290	UCCUAGCC G CUUGUUUU	1498	AAAACAAG UGAUG GCAUGCACUAUGC GCG GGCUAGGA	4007
1299	CUUGUUUU G CUCGCAGC	1499	GCUGCGAG UGAUG GCAUGCACUAUGC GCG AAAACAAG	4008
1303	UUUUGCUC G CAGCAGGU	1500	ACCUGCUG UGAUG GCAUGCACUAUGC GCG GAGCAAAA	4009
1335	UCGGGACU G ACAAUUCU	1501	AGAAUUGU UGAUG GCAUGCACUAUGC GCG AGUCCCGA	4010
1349	UCUGUCGU G CUCUCCCG	1502	CGGGAGAG UGAUG GCAUGCACUAUGC GCG ACGACAGA	4011
1357	GCUCUCCC G CAAAUAUA	1503	UAUAUUUG UGAUG GCAUGCACUAUGC GCG GGGAGAGC	4012
1382	CCAUGGCU G CUAGGCUG	1504	CAGCCUAG UGAUG GCAUGCACUAUGC GCG AGCCAUGG	4013
1392	UAGGCUGU G CUGCCAAC	1505	GUUGGCAG UGAUG GCAUGCACUAUGC GCG ACAGCCUA	4014
1395	GCUGUGCU G CCAACUGG	1506	CCAGUUGG UGAUG GCAUGCACUAUGC GCG AGCACAGC	4015
1411	GAUCCUAC G CGGGACGU	1507	ACGUCCCG UGAUG GCAUGCACUAUGC GCG GUAGGAUC	4016
1442	CCGUCGGC G CUGAAUCC	1508	GGAUUCAG UGAUG GCAUGCACUAUGC GCG GCCGACGG	4017
1445	UCGGCGCU G AAUCCCGC	1509	GCGGGAUU UGAUG GCAUGCACUAUGC GCG AGCGCCGA	4018
1452	UGAAUCCC G CGGACGAC	1510	GUCGUCCG UGAUG GCAUGCACUAUGC GCG GGGAUUCA	4019
1458	CCGCGGAC G ACCCCUCC	1511	GGAGGGGU UGAUG GCAUGCACUAUGC GCG GUCCGCGG	4020

Table 39

1474	CCGGGGCC G CUUGGGGC	1512	GCCCCAAG UGAUG GCAUGCACUAUGC GCG GGCCCCGG	4021
1489	GCUCUACC G CCCGCUUC	1513	GAAGCGGG UGAUG GCAUGCACUAUGC GCG GGUAGAGC	4022
1493	UACCGCCC G CUUCUCCG	1514	CGGAGAAG UGAUG GCAUGCACUAUGC GCG GGCGGUA	4023
1501	GCUUCUCC G CCUAUUGU	1515	ACAAUAGG UGAUG GCAUGCACUAUGC GCG GGAGAAGC	4024
1513	AUUGUACC G ACCGUCCA	1516	UGGACGGU UGAUG GCAUGCACUAUGC GCG GGUACAAU	4025
1528	CACGGGGC G CACCUCUC	1517	GAGAGGUG UGAUG GCAUGCACUAUGC GCG GCCCCGUG	4026
1542	CUCUUUAC G CGGACUCC	1518	GGAGUCCG UGAUG GCAUGCACUAUGC GCG GUAAAGAG	4027
1559	CCGUCUGU G CCUUCUCA	1519	UGAGAAGG UGAUG GCAUGCACUAUGC GCG ACAGACGG	4028
1571	UCUCAUCU G CCGGACCG	1520	CGGUCCGG UGAUG GCAUGCACUAUGC GCG AGAUGAGA	4029
1583	GACCGUGU G CACUUCGC	1521	GCGAAGUG UGAUG GCAUGCACUAUGC GCG ACACGGUC	4030
1590	UGCACUUC G CUUCACCU	1522	AGGUGAAG UGAUG GCAUGCACUAUGC GCG GAAGUGCA	4031
1601	UCACCUCU G CACGUCGC	1523	GCGACGUG UGAUG GCAUGCACUAUGC GCG AGAGGUGA	4032
1608	UGCACGUC G CAUGGAGA	1524	UCUCCAUG UGAUG GCAUGCACUAUGC GCG GACGUGCA	4033
1624	ACCACCGU G AACGCCCA	1525	UGGGCGUU UGAUG GCAUGCACUAUGC GCG ACGGUGGU	4034
1628	CCGUGAAC G CCCACAGG	1526	CCUGUGGG UGAUG GCAUGCACUAUGC GCG GUUCACGG	4035
1642	AGGAACCU G CCCAAGGU	1527	ACCUUGGG UGAUG GCAUGCACUAUGC GCG AGGUUCCU	4036
1654	AAGGUCUU G CAUAAGAG	1528	CUCUUAUG UGAUG GCAUGCACUAUGC GCG AAGACCUU	4037
1690	AUGUCAAC G ACCGACCU	1529	AGGUCGGU UGAUG GCAUGCACUAUGC GCG GUUGACAU	4038
1694	CAACGACC G ACCUUGAG	1530	CUCAAGGU UGAUG GCAUGCACUAUGC GCG GGUCGUUG	4039
1700	CCGACCUU G AGGCAUAC	1531	GUAUGCCU UGAUG GCAUGCACUAUGC GCG AAGGUCGG	4040
1730	UGUUUAAU G AGUGGGAG	1532	CUCCCACU UGAUG GCAUGCACUAUGC GCG AUUAAACA	4041
1818	AGCACCAU G CAACUUUU	1533	AAAAGUUG UGAUG GCAUGCACUAUGC GCG AUGGUGCU	4042
1835	UCACCUCU G CCUAAUCA	1534	UGAUUAGG UGAUG GCAUGCACUAUGC GCG AGAGGUGA	4043
1883	CAAGCUGU G CCUUGGGU	1535	ACCCAAGG UGAUG GCAUGCACUAUGC GCG ACAGCUUG	4044
1912	UGGACAUU G ACCCGUAU	1536	AUACGGGU UGAUG GCAUGCACUAUGC GCG AAUGUCCA	4045
1959	UCUUUUUU G CCUUCUGA	1537	UCAGAAGG UGAUG GCAUGCACUAUGC GCG AAAAAAGA	4046
1966	UGCCUUCU G ACUUCUUU	1538	AAAGAAGU UGAUG GCAUGCACUAUGC GCG AGAAGGCA	4047
1985	UUCUAUUC G AGAUCUCC	1539	GGAGAUCU UGAUG GCAUGCACUAUGC GCG GAAUAGAA	4048
1996	AUCUCCUC G ACACCGCC	1540	GGCGGUGU UGAUG GCAUGCACUAUGC GCG GAGGAGAU	4049
2002	UCGACACC G CCUCUGCU	1541	AGCAGAGG UGAUG GCAUGCACUAUGC GCG GGUGUCGA	4050
2008	CCGCCUCU G CUCUGUAU	1542	AUACAGAG UGAUG GCAUGCACUAUGC GCG AGAGGCGG	4051
2092	GUUGGGGU G AGUUGAUG	1543	CAUCAACU UGAUG GCAUGCACUAUGC GCG ACCCCAAC	4052
2097	GGUGAGUU G AUGAAUCU	1544	AGAUUCAU UGAUG GCAUGCACUAUGC GCG AACUCACC	4053
2100	GAGUUGAU G AAUCUAGC	1545	GCUAGAUU UGAUG GCAUGCACUAUGC GCG AUCAACUC	4054

Table 39

2237	UUUUGGGC G AGAAACUG	1546	CAGUUUCU UGAUG GCAUGCACUAUGC GCG GCCCAAAA	4055
2251	CUGUUCUU G AAUAUUUG	1547	CAAAUAUU UGAUG GCAUGCACUAUGC GCG AAGAACAG	4056
2282	GUGGAUUC G CACUCCUC	1548	GAGGAGUG UGAUG GCAUGCACUAUGC GCG GAAUCCAC	4057
2293	CUCCUCCU G CAUAUAGA	1549	UCUAUAUG UGAUG GCAUGCACUAUGC GCG AGGAGGAG	4058
2311	CACCAAAU G CCCCUAUC	1550	GAUAGGGG UGAUG GCAUGCACUAUGC GCG AUUUGGUG	4059
2354	UGUUAGAC G AAGAGGCA	1551	UGCCUCUU UGAUG GCAUGCACUAUGC GCG GUCUAACA	4060
2388	ACUCCCUC G CCUCGCAG	1552	CUGCGAGG UGAUG GCAUGCACUAUGC GCG GAGGGAGU	4061
2393	CUCGCCUC G CAGACGAA	1553	UUCGUCUG UGAUG GCAUGCACUAUGC GCG GAGGCGAG	4062
2399	UCGCAGAC G AAGGUCUC	1554	GAGACCUU UGAUG GCAUGCACUAUGC GCG GUCUGCGA	4063
2412	UCUCAAUC G CCGCGUCG	1555	CGACGCGG UGAUG GCAUGCACUAUGC GCG GAUUGAGA	4064
2415	CAAUCGCC G CGUCGCAG	1556	CUGCGACG UGAUG GCAUGCACUAUGC GCG GGCGAUUG	4065
2420	GCCGCGUC G CAGAAGAU	1557	AUCUUCUG UGAUG GCAUGCACUAUGC GCG GACGCGGC	4066
2514	GGUACCUU G CUUUAAUC	1558	GAUUAAAG UGAUG GCAUGCACUAUGC GCG AAGGUACC	4067
2549	CUUUUCCU G ACAUUCAU	1559	AUGAAUGU UGAUG GCAUGCACUAUGC GCG AGGAAAAG	4068
2560	AUUCAUUU G CAGGAGGA	1560	UCCUCCUG UGAUG GCAUGCACUAUGC GCG AAAUGAAU	4069
2576	ACAUUGUU G AUAGAUGU	1561	ACAUCUAU UGAUG GCAUGCACUAUGC GCG AACAAUGU	4070
2615	CAGUAAAU G AAAACAGG	1562	CCUGUUUU UGAUG GCAUGCACUAUGC GCG AUUUACUG	4071
2641	UUAACUAU G CCUGCUAG	1563	CUAGCAGG UGAUG GCAUGCACUAUGC GCG AUAGUUAA	4072
2645	CUAUGCCU G CUAGGUUU	1564	AAACCUAG UGAUG GCAUGCACUAUGC GCG AGGCAUAG	4073
2677	AAAUAUUU G CCCUUAGA	1565	UCUAAGGG UGAUG GCAUGCACUAUGC GCG AAAUAUUU	4074
2740	UUCCAGAC G CGACAUUA	1566	UAAUGUCG UGAUG GCAUGCACUAUGC GCG GUCUGGAA	4075
2742	CCAGACGC G ACAUUAUU	1567	AAUAAUGU UGAUG GCAUGCACUAUGC GCG GCGUCUGG	4076
2804	CACGUAGC G CCUCAUUU	1568	AAAUGAGG UGAUG GCAUGCACUAUGC GCG GCUACGUG	4077
2814	CUCAUUUU G CGGGUCAC	1569	GUGACCCG UGAUG GCAUGCACUAUGC GCG AAAAUGAG	4078
2875	CAAACCUC G AAAAGGCA	1570	UGCCUUUU UGAUG GCAUGCACUAUGC GCG GAGGUUUG	4079
2928	UCUUCCCC G AUCAUCAG	1571	CUGAUGAU UGAUG GCAUGCACUAUGC GCG GGGGAAGA	4080
2946	UGGACCCU G CAUUCAAA	1572	UUUGAAUG UGAUG GCAUGCACUAUGC GCG AGGGUCCA	4081
2990	CUCAACCC G CACAAGGA	1573	UCCUUGUG UGAUG GCAUGCACUAUGC GCG GGGUUGAG	4082
3012	GGCCGGAC G CCAACAAG	1574	CUUGUUGG UGAUG GCAUGCACUAUGC GCG GUCCGGCC	4083
3090	GCCCUCAC G CUCAGGGC	1575	GCCCUGAG UGAUG GCAUGCACUAUGC GCG GUGAGGGC	4084
3113	ACAACUGU G CCAGCAGC	1576	GCUGCUGG UGAUG GCAUGCACUAUGC GCG ACAGUUGU	4085
3132	CUCCUCCU G CCUCCACC	1577	GGUGGAGG UGAUG GCAUGCACUAUGC GCG AGGAGGAG	4086
51	AGGGCCCU G UACUUUCC	1578	GGAAAGUA UGAUG GCAUGCACUAUGC GCG AGGGCCCU	4087
106	AGAAUACU G UCUCUGCC	1579	GGCAGAGA UGAUG GCAUGCACUAUGC GCG AGUAUUCU	4088

Table 39

148	GGGACCCU G UACCGAAC	1580	GUUCGGUA UGAUG GCAUGCACUAUGC GCG AGGGUCCC	4089
198	CUGCUCGU G UUACAGGC	1581	GCCUGUAA UGAUG GCAUGCACUAUGC GCG ACGAGCAG	4090
219	UUUUUCUU G UUGACAAA	1582	UUUGUCAA UGAUG GCAUGCACUAUGC GCG AAGAAAAA	4091
297	ACACCCGU G UGUCUUGG	1583	CCAAGACA UGAUG GCAUGCACUAUGC GCG ACGGGUGU	4092
299	ACCCGUGU G UCUUGGCC	1584	GGCCAAGA UGAUG GCAUGCACUAUGC GCG ACACGGGU	4093
347	ACCAACCU G UUGUCCUC	1585	GAGGACAA UGAUG GCAUGCACUAUGC GCG AGGUUGGU	4094
350	AACCUGUU G UCCUCCAA	1586	UUGGAGGA UGAUG GCAUGCACUAUGC GCG AACAGGUU	4095
362	UCCAAUUU G UCCUGGUU	1587	AACCAGGA UGAUG GCAUGCACUAUGC GCG AAAUUGGA	4096
381	CGCUGGAU G UGUCUGCG	1588	CGCAGACA UGAUG GCAUGCACUAUGC GCG AUCCAGCG	4097
383	CUGGAUGU G UCUGCGGC	1589	GCCGCAGA UGAUG GCAUGCACUAUGC GCG ACAUCCAG	4098
438	AUCUUCUU G UUGGUUCU	1590	AGAACCAA UGAUG GCAUGCACUAUGC GCG AAGAAGAU	4099
465	CAAGGUAU G UUGCCCGU	1591	ACGGGCAA UGAUG GCAUGCACUAUGC GCG AUACCUUG	4100
476	GCCCGUUU G UCCUCUAA	1592	UUAGAGGA UGAUG GCAUGCACUAUGC GCG AAACGGGC	4101
555	ACCUCUAU G UUUCCCUC	1593	GAGGGAAA UGAUG GCAUGCACUAUGC GCG AUAGAGGU	4102
566	UCCCUCAU G UUGCUGUA	1594	UACAGCAA UGAUG GCAUGCACUAUGC GCG AUGAGGGA	4103
572	AUGUUGCU G UACAAAAC	1595	GUUUUGUA UGAUG GCAUGCACUAUGC GCG AGCAACAU	4104
602	CUGCACCU G UAUUCCCA	1596	UGGGAAUA UGAUG GCAUGCACUAUGC GCG AGGUGCAG	4105
694	UGCCAUUU G UUCAGUGG	1597	CCACUGAA UGAUG GCAUGCACUAUGC GCG AAAUGGCA	4106
724	CCCCCACU G UCUGGCUU	1598	AAGCCAGA UGAUG GCAUGCACUAUGC GCG AGUGGGGG	4107
750	UGGAUGAU G UGGUUUUG	1599	CAAAACCA UGAUG GCAUGCACUAUGC GCG AUCAUCCA	4108
771	CCAAGUCU G UACAACAU	1600	AUGUUGUA UGAUG GCAUGCACUAUGC GCG AGACUUGG	4109
801	AUGCCGCU G UUACCAAU	1601	AUUGGUAA UGAUG GCAUGCACUAUGC GCG AGCGGCAU	4110
818	UUUCUUUU G UCUUUGGG	1602	CCCAAAGA UGAUG GCAUGCACUAUGC GCG AAAAGAAA	4111
888	UGGGAUAU G UAAUUGGG	1603	CCCAAUUA UGAUG GCAUGCACUAUGC GCG AUAUCCCA	4112
927	AACAUAUU G UACAAAAA	1604	UUUUUGUA UGAUG GCAUGCACUAUGC GCG AAUAUGUU	4113
944	AUCAAAAU G UGUUUUAG	1605	CUAAAACA UGAUG GCAUGCACUAUGC GCG AUUUUGAU	4114
946	CAAAAUGU G UUUUAGGA	1606	UCCUAAAA UGAUG GCAUGCACUAUGC GCG ACAUUUUG	4115
963	AACUUCCU G UAAACAGG	1607	CCUGUUUA UGAUG GCAUGCACUAUGC GCG AGGAAGUU	4116
991	GAAAGUAU G UCAACGAA	1608	UUCGUUGA UGAUG GCAUGCACUAUGC GCG AUACUUUC	4117
1002	AACGAAUU G UGGGUCUU	1609	AAGACCCA UGAUG GCAUGCACUAUGC GCG AAUUCGUU	4118
1039	CACGCAAU G UGGAUAUU	1610	AAUAUCCA UGAUG GCAUGCACUAUGC GCG AUUGCGUG	4119
1137	AACAGUAU G UGAACCUU	1611	AAGGUUCA UGAUG GCAUGCACUAUGC GCG AUACUGUU	4120
1184	UGCCAAGU G UUUGCUGA	1612	UCAGCAAA UGAUG GCAUGCACUAUGC GCG ACUUGGCA	4121
1251	GAACCUUU G UGUCUCCU	1613	AGGAGACA UGAUG GCAUGCACUAUGC GCG AAAGGUUC	4122

Table 39

1253	ACCUUUGU G UCUCCUCU	1614	AGAGGAGA UGAUG GCAUGCACUAUGC GCG ACAAAGGU	4123
1294	AGCCGCUU G UUUUGCUC	1615	GAGCAAAA UGAUG GCAUGCACUAUGC GCG AAGCGGCU	4124
1344	ACAAUUCU G UCGUGCUC	1616	GAGCACGA UGAUG GCAUGCACUAUGC GCG AGAAUUGU	4125
1390	GCUAGGCU G UGCUGCCA	1617	UGGCAGCA UGAUG GCAUGCACUAUGC GCG AGCCUAGC	4126
1425	CGUCCUUU G UUUACGUC	1618	GACGUAAA UGAUG GCAUGCACUAUGC GCG AAAGGACG	4127
1508	CGCCUAUU G UACCGACC	1619	GGUCGGUA UGAUG GCAUGCACUAUGC GCG AAUAGGCG	4128
1557	CCCCGUCU G UGCCUUCU	1620	AGAAGGCA UGAUG GCAUGCACUAUGC GCG AGACGGGG	4129
1581	CGGACCGU G UGCACUUC	1621	GAAGUGCA UGAUG GCAUGCACUAUGC GCG ACGGUCCG	4130
1684	UCAGCAAU G UCAACGAC	1622	GUCGUUGA UGAUG GCAUGCACUAUGC GCG AUUGCUGA	4131
1719	CAAAGACU G UGUGUUUA	1623	UAAACACA UGAUG GCAUGCACUAUGC GCG AGUCUUUG	4132
1721	AAGACUGU G UGUUUAAU	1624	AUUAAACA UGAUG GCAUGCACUAUGC GCG ACAGUCUU	4133
1723	GACUGUGU G UUUAAUGA	1625	UCAUUAAA UGAUG GCAUGCACUAUGC GCG ACACAGUC	4134
1772	AGGUCUUU G UACUAGGA	1626	UCCUAGUA UGAUG GCAUGCACUAUGC GCG AAAGACCU	4135
1785	AGGAGGCU G UAGGCAUA	1627	UAUGCCUA UGAUG GCAUGCACUAUGC GCG AGCCUCCU	4136
1801	AAAUUGGU G UGUUCACC	1628	GGUGAACA UGAUG GCAUGCACUAUGC GCG ACCAAUUU	4137
1803	AUUGGUGU G UUCACCAG	1629	CUGGUGAA UGAUG GCAUGCACUAUGC GCG ACACCAAU	4138
1850	CAUCUCAU G UUCAUGUC	1630	GACAUGAA UGAUG GCAUGCACUAUGC GCG AUGAGAUG	4139
1856	AUGUUCAU G UCCUACUG	1631	CAGUAGGA UGAUG GCAUGCACUAUGC GCG AUGAACAU	4140
1864	GUCCUACU G UUCAAGCC	1632	GGCUUGAA UGAUG GCAUGCACUAUGC GCG AGUAGGAC	4141
1881	UCCAAGCU G UGCCUUGG	1633	CCAAGGCA UGAUG GCAUGCACUAUGC GCG AGCUUGGA	4142
1939	GAGCUUCU G UGGAGUUA	1634	UAACUCCA UGAUG GCAUGCACUAUGC GCG AGAAGCUC	4143
2013	UCUGCUCU G UAUCGGGG	1635	CCCCGAUA UGAUG GCAUGCACUAUGC GCG AGAGCAGA	4144
2045	GGAACAUU G UUCACCUC	1636	GAGGUGAA UGAUG GCAUGCACUAUGC GCG AAUGUUCC	4145
2082	GCUAUUCU G UGUUGGGG	1637	CCCCAACA UGAUG GCAUGCACUAUGC GCG AGAAUAGC	4146
2084	UAUUCUGU G UUGGGGUG	1638	CACCCCAA UGAUG GCAUGCACUAUGC GCG ACAGAAUA	4147
2167	UCAGCUAU G UCAACGUU	1639	AACGUUGA UGAUG GCAUGCACUAUGC GCG AUAGCUGA	4148
2205	CAACUAUU G UGGUUUCA	1640	UGAAACCA UGAUG GCAUGCACUAUGC GCG AAUAGUUG	4149
2222	CAUUUCCU G UCUUACUU	1641	AAGUAAGA UGAUG GCAUGCACUAUGC GCG AGGAAAUG	4150
2245	GAGAAACU G UUCUUGAA	1642	UUCAAGAA UGAUG GCAUGCACUAUGC GCG AGUUUCUC	4151
2262	UAUUUGGU G UCUUUUGG	1643	CCAAAAGA UGAUG GCAUGCACUAUGC GCG ACCAAAUA	4152
2274	UUUGGAGU G UGGAUUCG	1644	CGAAUCCA UGAUG GCAUGCACUAUGC GCG ACUCCAAA	4153
2344	AAACUACU G UUGUUAGA	1645	UCUAACAA UGAUG GCAUGCACUAUGC GCG AGUAGUUU	4154
2347	CUACUGUU G UUAGACGA	1646	UCGUCUAA UGAUG GCAUGCACUAUGC GCG AACAGUAG	4155
2450	AUCUCAAU G UUAGUAUU	1647	AAUACUAA UGAUG GCAUGCACUAUGC GCG AUUGAGAU	4156

Table 39

2573	AGGACAUU G UUGAUAGA	1648	UCUAUCAA UGAUG GCAUGCACUAUGC GCG AAUGUCCU	4157
2583	UGAUAGAU G UAAGCAAU	1649	AUUGCUUA UGAUG GCAUGCACUAUGC GCG AUCUAUCA	4158
2594	AGCAAUUU G UGGGGCCC	1650	GGGCCCCA UGAUG GCAUGCACUAUGC GCG AAAUUGCU	4159
2663	AUCCCAAU G UUACUAAA	1651	UUUAGUAA UGAUG GCAUGCACUAUGC GCG AUUGGGAU	4160
2717	CAGAGUAU G UAGUUAAU	1652	AUUAACUA UGAUG GCAUGCACUAUGC GCG AUACUCUG	4161
2901	AUCUUUCU G UCCCCAAU	1653	AUUGGGGA UGAUG GCAUGCACUAUGC GCG AGAAAGAU	4162
3071	GGGGGACU G UUGGGGUG	1654	CACCCCAA UGAUG GCAUGCACUAUGC GCG AGUCCCCC	4163
3111	UCACAACU G UGCCAGCA	1655	UGCUGGCA UGAUG GCAUGCACUAUGC GCG AGUUGUGA	4164

Input Sequence = AF100308. Cut Site = YG/M or UG/U.
Stem Length = 8. Core Sequence = UGAUG GCAUGCACUAUGC GCG
AF100308 (Hepatitis B virus strain 2-18, 3215 bp)

Table 40

Table 40: Human HBV Zinzyme Ribozyme and Substrate Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
61	ACUUUCCU G CUGGUGGC	1448	GCCACCAG GCcgaaagGCGaGuCaaGGuCu AGGAAAGU	4165
94	UGAGCCCU G CUCAGAAU	1450	AUUCUGAG GCcgaaagGCGaGuCaaGGuCu AGGGCUCA	4166
112	CUGUCUCU G CCAUAUCG	1451	CGAUAUGG GCcgaaagGCGaGuCaaGGuCu AGAGACAG	4167
169	AGAACAUC G CAUCAGGA	1454	UCCUGAUG GCcgaaagGCGaGuCaaGGuCu GAUGUUCU	4168
192	GGACCCCU G CUCGUGUU	1455	AACACGAG GCcgaaagGCGaGuCaaGGuCu AGGGGUCC	4169
315	CAAAAUUC G CAGUCCCA	1457	UGGGACUG GCcgaaagGCGaGuCaaGGuCu GAAUUUUG	4170
374	UGGUUAUC G CUGGAUGU	1458	ACAUCCAG GCcgaaagGCGaGuCaaGGuCu GAUAACCA	4171
387	AUGUGUCU G CGGCGUUU	1459	AAACGCCG GCcgaaagGCGaGuCaaGGuCu AGACACAU	4172
410	CUUCCUCU G CAUCCUGC	1460	GCAGGAUG GCcgaaagGCGaGuCaaGGuCu AGAGGAAG	4173
417	UGCAUCCU G CUGCUAUG	1461	CAUAGCAG GCcgaaagGCGaGuCaaGGuCu AGGAUGCA	4174
420	AUCCUGCU G CUAUGCCU	1462	AGGCAUAG GCcgaaagGCGaGuCaaGGuCu AGCAGGAU	4175
425	GCUGCUAU G CCUCAUCU	1463	AGAUGAGG GCcgaaagGCGaGuCaaGGuCu AUAGCAGC	4176
468	GGUAUGUU G CCCGUUUG	1464	CAAACGGG GCcgaaagGCGaGuCaaGGuCu AACAUACC	4177
518	CGGACCAU G CAAAACCU	1465	AGGUUUUG GCcgaaagGCGaGuCaaGGuCu AUGGUCCG	4178
527	CAAAACCU G CACAACUC	1466	GAGUUGUG GCcgaaagGCGaGuCaaGGuCu AGGUUUUG	4179
538	CAACUCCU G CUCAAGGA	1467	UCCUUGAG GCcgaaagGCGaGuCaaGGuCu AGGAGUUG	4180
569	CUCAUGUU G CUGUACAA	1468	UUGUACAG GCcgaaagGCGaGuCaaGGuCu AACAUGAG	4181
596	CGGAAACU G CACCUGUA	1469	UACAGGUG GCcgaaagGCGaGuCaaGGuCu AGUUUCCG	4182
631	GGGCUUUC G CAAAAUAC	1470	GUAUUUUG GCcgaaagGCGaGuCaaGGuCu GAAAGCCC	4183
687	UUACUAGU G CCAUUUGU	1471	ACAAAUGG GCcgaaagGCGaGuCaaGGuCu ACUAGUAA	4184
795	CCCUUUAU G CCGCUGUU	1474	AACAGCGG GCcgaaagGCGaGuCaaGGuCu AUAAAGGG	4185
798	UUUAUGCC G CUGUUACC	1475	GGUAACAG GCcgaaagGCGaGuCaaGGuCu GGCAUAAA	4186
911	GGCACAUU G CCACAGGA	1476	UCCUGUGG GCcgaaagGCGaGuCaaGGuCu AAUGUGCC	4187
1020	UGGGGUUU G CCGCCCCU	1479	AGGGGCGG GCcgaaagGCGaGuCaaGGuCu AAACCCCA	4188
1023	GGUUUGCC G CCCCUUUC	1480	GAAAGGGG GCcgaaagGCGaGuCaaGGuCu GGCAAACC	4189
1034	CCUUUCAC G CAAUGUGG	1481	CCACAUUG GCcgaaagGCGaGuCaaGGuCu GUGAAAGG	4190
1050	GAUAUUCU G CUUUAAUG	1482	CAUUAAAG GCcgaaagGCGaGuCaaGGuCu AGAAUAUC	4191
1058	GCUUUAAU G CCUUUAUA	1483	UAUAAAGG GCcgaaagGCGaGuCaaGGuCu AUUAAAGC	4192
1068	CUUUAUAU G CAUGCAUA	1484	UAUGCAUG GCcgaaagGCGaGuCaaGGuCu AUAUAAAG	4193
1072	AUAUGCAU G CAUACAAG	1485	CUUGUAUG GCcgaaagGCGaGuCaaGGuCu AUGCAUAU	4194

Table 40

1103	ACUUUCUC G CCAACUUA	1486	UAAGUUGG GCcgaaagGCGaGuCaaGGuCu GAGAAAGU	4195
1155	ACCCCGUU G CUCGGCAA	1488	UUGCCGAG GCcgaaagGCGaGuCaaGGuCu AACGGGGU	4196
1177	UGGUCUAU G CCAAGUGU	1489	ACACUUGG GCcgaaagGCGaGuCaaGGuCu AUAGACCA	4197
1188	AAGUGUUU G CUGACGCA	1490	UGCGUCAG GCcgaaagGCGaGuCaaGGuCu AAACACUU	4198
1194	UUGCUGAC G CAACCCCC	1492	GGGGGUUG GCcgaaagGCGaGuCaaGGuCu GUCAGCAA	4199
1234	CCAUCAGC G CAUGCGUG	1493	CACGCAUG GCcgaaagGCGaGuCaaGGuCu GCUGAUGG	4200
1238	CAGCGCAU G CGUGGAAC	1494	GUUCCACG GCcgaaagGCGaGuCaaGGuCu AUGCGCUG	4201
1262	UCUCCUCU G CCGAUCCA	1495	UGGAUCGG GCcgaaagGCGaGuCaaGGuCu AGAGGAGA	4202
1275	UCCAUACC G CGGAACUC	1497	GAGUUCCG GCcgaaagGCGaGuCaaGGuCu GGUAUGGA	4203
1290	UCCUAGCC G CUUGUUUU	1498	AAAACAAG GCcgaaagGCGaGuCaaGGuCu GGCUAGGA	4204
1299	CUUGUUUU G CUCGCAGC	1499	GCUGCGAG GCcgaaagGCGaGuCaaGGuCu AAAACAAG	4205
1303	UUUUGCUC G CAGCAGGU	1500	ACCUGCUG GCcgaaagGCGaGuCaaGGuCu GAGCAAAA	4206
1349	UCUGUCGU G CUCUCCCG	1502	CGGGAGAG GCcgaaagGCGaGuCaaGGuCu ACGACAGA	4207
1357	GCUCUCCC G CAAAUAUA	1503	UAUAUUUG GCcgaaagGCGaGuCaaGGuCu GGGAGAGC	4208
1382	CCAUGGCU G CUAGGCUG	1504	CAGCCUAG GCcgaaagGCGaGuCaaGGuCu AGCCAUGG	4209
1392	UAGGCUGU G CUGCCAAC	1505	GUUGGCAG GCcgaaagGCGaGuCaaGGuCu ACAGCCUA	4210
1395	GCUGUGCU G CCAACUGG	1506	CCAGUUGG GCcgaaagGCGaGuCaaGGuCu AGCACAGC	4211
1411	GAUCCUAC G CGGGACGU	1507	ACGUCCCG GCcgaaagGCGaGuCaaGGuCu GUAGGAUC	4212
1442	CCGUCGGC G CUGAAUCC	1508	GGAUUCAG GCcgaaagGCGaGuCaaGGuCu GCCGACGG	4213
1452	UGAAUCCC G CGGACGAC	1510	GUCGUCCG GCcgaaagGCGaGuCaaGGuCu GGGAUUCA	4214
1474	CCGGGGCC G CUUGGGGC	1512	GCCCCAAG GCcgaaagGCGaGuCaaGGuCu GGCCCCGG	4215
1489	GCUCUACC G CCCGCUUC	1513	GAAGCGGG GCcgaaagGCGaGuCaaGGuCu GGUAGAGC	4216
1493	UACCGCCC G CUUCUCCG	1514	CGGAGAAG GCcgaaagGCGaGuCaaGGuCu GGGCGGUA	4217
1501	GCUUCUCC G CCUAUUGU	1515	ACAAUAGG GCcgaaagGCGaGuCaaGGuCu GGAGAAGC	4218
1528	CACGGGGC G CACCUCUC	1517	GAGAGGUG GCcgaaagGCGaGuCaaGGuCu GCCCCGUG	4219
1542	CUCUUUAC G CGGACUCC	1518	GGAGUCCG GCcgaaagGCGaGuCaaGGuCu GUAAAGAG	4220
1559	CCGUCUGU G CCUUCUCA	1519	UGAGAAGG GCcgaaagGCGaGuCaaGGuCu ACAGACGG	4221
1571	UCUCAUCU G CCGGACCG	1520	CGGUCCGG GCcgaaagGCGaGuCaaGGuCu AGAUGAGA	4222
1583	GACCGUGU G CACUUCGC	1521	GCGAAGUG GCcgaaagGCGaGuCaaGGuCu ACACGGUC	4223
1590	UGCACUUC G CUUCACCU	1522	AGGUGAAG GCcgaaagGCGaGuCaaGGuCu GAAGUGCA	4224
1601	UCACCUCU G CACGUCGC	1523	GCGACGUG GCcgaaagGCGaGuCaaGGuCu AGAGGUGA	4225
1608	UGCACGUC G CAUGGAGA	1524	UCUCCAUG GCcgaaagGCGaGuCaaGGuCu GACGUGCA	4226
1628	CCGUGAAC G CCCACAGG	1526	CCUGUGGG GCcgaaagGCGaGuCaaGGuCu GUUCACGG	4227
1642	AGGAACCU G CCCAAGGU	1527	ACCUUGGG GCcgaaagGCGaGuCaaGGuCu AGGUUCCU	4228

Table 40

1654	AAGGUCUU G CAUAAGAG	1528	CUCUUAUG GCcgaaagGCGaGuCaaGGuCu AAGACCUU	4229
1818	AGCACCAU G CAACUUUU	1533	AAAAGUUG GCcgaaagGCGaGuCaaGGuCu AUGGUGCU	4230
1835	UCACCUCU G CCUAAUCA	1534	UGAUUAGG GCcgaaagGCGaGuCaaGGuCu AGAGGUGA	4231
1883	CAAGCUGU G CCUUGGGU	1535	ACCCAAGG GCcgaaagGCGaGuCaaGGuCu ACAGCUUG	4232
1959	UCUUUUUU G CCUUCUGA	1537	UCAGAAGG GCcgaaagGCGaGuCaaGGuCu AAAAAAGA	4233
2002	UCGACACC G CCUCUGCU	1541	AGCAGAGG GCcgaaagGCGaGuCaaGGuCu GGUGUCGA	4234
2008	CCGCCUCU G CUCUGUAU	1542	AUACAGAG GCcgaaagGCGaGuCaaGGuCu AGAGGCGG	4235
2282	GUGGAUUC G CACUCCUC	1548	GAGGAGUG GCcgaaagGCGaGuCaaGGuCu GAAUCCAC	4236
2293	CUCCUCCU G CAUAUAGA	1549	UCUAUAUG GCcgaaagGCGaGuCaaGGuCu AGGAGGAG	4237
2311	CACCAAAU G CCCCUAUC	1550	GAUAGGGG GCcgaaagGCGaGuCaaGGuCu AUUUGGUG	4238
2388	ACUCCCUC G CCUCGCAG	1552	CUGCGAGG GCcgaaagGCGaGuCaaGGuCu GAGGGAGU	4239
2393	CUCGCCUC G CAGACGAA	1553	UUCGUCUG GCcgaaagGCGaGuCaaGGuCu GAGGCGAG	4240
2412	UCUCAAUC G CCGCGUCG	1555	CGACGCGG GCcgaaagGCGaGuCaaGGuCu GAUUGAGA	4241
2415	CAAUCGCC G CGUCGCAG	1556	CUGCGACG GCcgaaagGCGaGuCaaGGuCu GGCGAUUG	4242
2420	GCCGCGUC G CAGAAGAU	1557	AUCUUCUG GCcgaaagGCGaGuCaaGGuCu GACGCGGC	4243
2514	GGUACCUU G CUUUAAUC	1558	GAUUAAAG GCcgaaagGCGaGuCaaGGuCu AAGGUACC	4244
2560	AUUCAUUU G CAGGAGGA	1560	UCCUCCUG GCcgaaagGCGaGuCaaGGuCu AAAUGAAU	4245
2641	UUAACUAU G CCUGCUAG	1563	CUAGCAGG GCcgaaagGCGaGuCaaGGuCu AUAGUUAA	4246
2645	CUAUGCCU G CUAGGUUU	1564	AAACCUAG GCcgaaagGCGaGuCaaGGuCu AGGCAUAG	4247
2677	AAAUAUUU G CCCUUAGA	1565	UCUAAGGG GCcgaaagGCGaGuCaaGGuCu AAAUAUUU	4248
2740	UUCCAGAC G CGACAUUA	1566	UAAUGUCG GCcgaaagGCGaGuCaaGGuCu GUCUGGAA	4249
2804	CACGUAGC G CCUCAUUU	1568	AAAUGAGG GCcgaaagGCGaGuCaaGGuCu GCUACGUG	4250
2814	CUCAUUUU G CGGGUCAC	1569	GUGACCCG GCcgaaagGCGaGuCaaGGuCu AAAAUGAG	4251
2946	UGGACCCU G CAUUCAAA	1572	UUUGAAUG GCcgaaagGCGaGuCaaGGuCu AGGGUCCA	4252
2990	CUCAACCC G CACAAGGA	1573	UCCUUGUG GCcgaaagGCGaGuCaaGGuCu GGGUUGAG	4253
3012	GGCCGGAC G CCAACAAG	1574	CUUGUUGG GCcgaaagGCGaGuCaaGGuCu GUCCGGCC	4254
3090	GCCCUCAC G CUCAGGGC	1575	GCCCUGAG GCcgaaagGCGaGuCaaGGuCu GUGAGGGC	4255
3113	ACAACUGU G CCAGCAGC	1576	GCUGCUGG GCcgaaagGCGaGuCaaGGuCu ACAGUUGU	4256
3132	CUCCUCCU G CCUCCACC	1577	GGUGGAGG GCcgaaagGCGaGuCaaGGuCu AGGAGGAG	4257
51	AGGGCCCU G UACUUUCC	1578	GGAAAGUA GCcgaaagGCGaGuCaaGGuCu AGGGCCCU	4258
106	AGAAUACU G UCUCUGCC	1579	GGCAGAGA GCcgaaagGCGaGuCaaGGuCu AGUAUUCU	4259
148	GGGACCCU G UACCGAAC	1580	GUUCGGUA GCcgaaagGCGaGuCaaGGuCu AGGGUCCC	4260
198	CUGCUCGU G UUACAGGC	1581	GCCUGUAA GCcgaaagGCGaGuCaaGGuCu ACGAGCAG	4261
219	UUUUUCUU G UUGACAAA	1582	UUUGUCAA GCcgaaagGCGaGuCaaGGuCu AAGAAAAA	4262

Table 40

297	ACACCCGU G UGUCUUGG	1583	CCAAGACA GCcgaaagGCGaGuCaaGGuCu ACGGGUGU	4263
299	ACCCGUGU G UCUUGGCC	1584	GGCCAAGA GCcgaaagGCGaGuCaaGGuCu ACACGGGU	4264
347	ACCAACCU G UUGUCCUC	1585	GAGGACAA GCcgaaagGCGaGuCaaGGuCu AGGUUGGU	4265
350	AACCUGUU G UCCUCCAA	1586	UUGGAGGA GCcgaaagGCGaGuCaaGGuCu AACAGGUU	4266
362	UCCAAUUU G UCCUGGUU	1587	AACCAGGA GCcgaaagGCGaGuCaaGGuCu AAAUUGGA	4267
381	CGCUGGAU G UGUCUGCG	1588	CGCAGACA GCcgaaagGCGaGuCaaGGuCu AUCCAGCG	4268
383	CUGGAUGU G UCUGCGGC	1589	GCCGCAGA GCcgaaagGCGaGuCaaGGuCu ACAUCCAG	4269
438	AUCUUCUU G UUGGUUCU	1590	AGAACCAA GCcgaaagGCGaGuCaaGGuCu AAGAAGAU	4270
465	CAAGGUAU G UUGCCCGU	1591	ACGGGCAA GCcgaaagGCGaGuCaaGGuCu AUACCUUG	4271
476	GCCCGUUU G UCCUCUAA	1592	UUAGAGGA GCcgaaagGCGaGuCaaGGuCu AAACGGGC	4272
555	ACCUCUAU G UUUCCCUC	1593	GAGGGAAA GCcgaaagGCGaGuCaaGGuCu AUAGAGGU	4273
566	UCCCUCAU G UUGCUGUA	1594	UACAGCAA GCcgaaagGCGaGuCaaGGuCu AUGAGGGA	4274
572	AUGUUGCU G UACAAAAC	1595	GUUUUGUA GCcgaaagGCGaGuCaaGGuCu AGCAACAU	4275
602	CUGCACCU G UAUUCCCA	1596	UGGGAAUA GCcgaaagGCGaGuCaaGGuCu AGGUGCAG	4276
694	UGCCAUUU G UUCAGUGG	1597	CCACUGAA GCcgaaagGCGaGuCaaGGuCu AAAUGGCA	4277
724	CCCCCACU G UCUGGCUU	1598	AAGCCAGA GCcgaaagGCGaGuCaaGGuCu AGUGGGGG	4278
750	UGGAUGAU G UGGUUUUG	1599	CAAAACCA GCcgaaagGCGaGuCaaGGuCu AUCAUCCA	4279
771	CCAAGUCU G UACAACAU	1600	AUGUUGUA GCcgaaagGCGaGuCaaGGuCu AGACUUGG	4280
801	AUGCCGCU G UUACCAAU	1601	AUUGGUAA GCcgaaagGCGaGuCaaGGuCu AGCGGCAU	4281
818	UUUCUUUU G UCUUUGGG	1602	CCCAAAGA GCcgaaagGCGaGuCaaGGuCu AAAAGAAA	4282
888	UGGGAUAU G UAAUUGGG	1603	CCCAAUUA GCcgaaagGCGaGuCaaGGuCu AUAUCCCA	4283
927	AACAUAUU G UACAAAAA	1604	UUUUUGUA GCcgaaagGCGaGuCaaGGuCu AAUAUGUU	4284
944	AUCAAAAU G UGUUUUAG	1605	CUAAAACA GCcgaaagGCGaGuCaaGGuCu AUUUUGAU	4285
946	CAAAAUGU G UUUUAGGA	1606	UCCUAAAA GCcgaaagGCGaGuCaaGGuCu ACAUUUUG	4286
963	AACUUCCU G UAAACAGG	1607	CCUGUUUA GCcgaaagGCGaGuCaaGGuCu AGGAAGUU	4287
991	GAAAGUAU G UCAACGAA	1608	UUCGUUGA GCcgaaagGCGaGuCaaGGuCu AUACUUUC	4288
1002	AACGAAUU G UGGGUCUU	1609	AAGACCCA GCcgaaagGCGaGuCaaGGuCu AAUUCGUU	4289
1039	CACGCAAU G UGGAUAUU	1610	AAUAUCCA GCcgaaagGCGaGuCaaGGuCu AUUGCGUG	4290
1137	AACAGUAU G UGAACCUU	1611	AAGGUUCA GCcgaaagGCGaGuCaaGGuCu AUACUGUU	4291
1184	UGCCAAGU G UUUGCUGA	1612	UCAGCAAA GCcgaaagGCGaGuCaaGGuCu ACUUGGCA	4292
1251	GAACCUUU G UGUCUCCU	1613	AGGAGACA GCcgaaagGCGaGuCaaGGuCu AAAGGUUC	4293
1253	ACCUUUGU G UCUCCUCU	1614	AGAGGAGA GCcgaaagGCGaGuCaaGGuCu ACAAAGGU	4294
1294	AGCCGCUU G UUUUGCUC	1615	GAGCAAAA GCcgaaagGCGaGuCaaGGuCu AAGCGGCU	4295
1344	ACAAUUCU G UCGUGCUC	1616	GAGCACGA GCcgaaagGCGaGuCaaGGuCu AGAAUUGU	4296

Table 40

1390	GCUAGGCU G UGCUGCCA	1617	UGGCAGCA GCcgaaagGCGaGuCaaGGuCu AGCCUAGC	4297
1425	CGUCCUUU G UUUACGUC	1618	GACGUAAA GCcgaaagGCGaGuCaaGGuCu AAAGGACG	4298
1508	CGCCUAUU G UACCGACC	1619	GGUCGGUA GCcgaaagGCGaGuCaaGGuCu AAUAGGCG	4299
1557	CCCCGUCU G UGCCUUCU	1620	AGAAGGCA GCcgaaagGCGaGuCaaGGuCu AGACGGGG	4300
1581	CGGACCGU G UGCACUUC	1621	GAAGUGCA GCcgaaagGCGaGuCaaGGuCu ACGGUCCG	4301
1684	UCAGCAAU G UCAACGAC	1622	GUCGUUGA GCcgaaagGCGaGuCaaGGuCu AUUGCUGA	4302
1719	CAAAGACU G UGUGUUUA	1623	UAAACACA GCcgaaagGCGaGuCaaGGuCu AGUCUUUG	4303
1721	AAGACUGU G UGUUUAAU	1624	AUUAAACA GCcgaaagGCGaGuCaaGGuCu ACAGUCUU	4304
1723	GACUGUGU G UUUAAUGA	1625	UCAUUAAA GCcgaaagGCGaGuCaaGGuCu ACACAGUC	4305
1772	AGGUCUUU G UACUAGGA	1626	UCCUAGUA GCcgaaagGCGaGuCaaGGuCu AAAGACCU	4306
1785	AGGAGGCU G UAGGCAUA	1627	UAUGCCUA GCcgaaagGCGaGuCaaGGuCu AGCCUCCU	4307
1801	AAAUUGGU G UGUUCACC	1628	GGUGAACA GCcgaaagGCGaGuCaaGGuCu ACCAAUUU	4308
1803	AUUGGUGU G UUCACCAG	1629	CUGGUGAA GCcgaaagGCGaGuCaaGGuCu ACACCAAU	4309
1850	CAUCUCAU G UUCAUGUC	1630	GACAUGAA GCcgaaagGCGaGuCaaGGuCu AUGAGAUG	4310
1856	AUGUUCAU G UCCUACUG	1631	CAGUAGGA GCcgaaagGCGaGuCaaGGuCu AUGAACAU	4311
1864	GUCCUACU G UUCAAGCC	1632	GGCUUGAA GCcgaaagGCGaGuCaaGGuCu AGUAGGAC	4312
1881	UCCAAGCU G UGCCUUGG	1633	CCAAGGCA GCcgaaagGCGaGuCaaGGuCu AGCUUGGA	4313
1939	GAGCUUCU G UGGAGUUA	1634	UAACUCCA GCcgaaagGCGaGuCaaGGuCu AGAAGCUC	4314
2013	UCUGCUCU G UAUCGGGG	1635	CCCCGAUA GCcgaaagGCGaGuCaaGGuCu AGAGCAGA	4315
2045	GGAACAUU G UUCACCUC	1636	GAGGUGAA GCcgaaagGCGaGuCaaGGuCu AAUGUUCC	4316
2082	GCUAUUCU G UGUUGGGG	1637	CCCCAACA GCcgaaagGCGaGuCaaGGuCu AGAAUAGC	4317
2084	UAUUCUGU G UUGGGGUG	1638	CACCCCAA GCcgaaagGCGaGuCaaGGuCu ACAGAAUA	4318
2167	UCAGCUAU G UCAACGUU	1639	AACGUUGA GCcgaaagGCGaGuCaaGGuCu AUAGCUGA	4319
2205	CAACUAUU G UGGUUUCA	1640	UGAAACCA GCcgaaagGCGaGuCaaGGuCu AAUAGUUG	4320
2222	CAUUUCCU G UCUUACUU	1641	AAGUAAGA GCcgaaagGCGaGuCaaGGuCu AGGAAAUG	4321
2245	GAGAAACU G UUCUUGAA	1642	UUCAAGAA GCcgaaagGCGaGuCaaGGuCu AGUUUCUC	4322
2262	UAUUUGGU G UCUUUUGG	1643	CCAAAAGA GCcgaaagGCGaGuCaaGGuCu ACCAAAUA	4323
2274	UUUGGAGU G UGGAUUCG	1644	CGAAUCCA GCcgaaagGCGaGuCaaGGuCu ACUCCAAA	4324
2344	AAACUACU G UUGUUAGA	1645	UCUAACAA GCcgaaagGCGaGuCaaGGuCu AGUAGUUU	4325
2347	CUACUGUU G UUAGACGA	1646	UCGUCUAA GCcgaaagGCGaGuCaaGGuCu AACAGUAG	4326
2450	AUCUCAAU G UUAGUAUU	1647	AAUACUAA GCcgaaagGCGaGuCaaGGuCu AUUGAGAU	4327
2573	AGGACAUU G UUGAUAGA	1648	UCUAUCAA GCcgaaagGCGaGuCaaGGuCu AAUGUCCU	4328
2583	UGAUAGAU G UAAGCAAU	1649	AUUGCUUA GCcgaaagGCGaGuCaaGGuCu AUCUAUCA	4329
2594	AGCAAUUU G UGGGGCCC	1650	GGGCCCCA GCcgaaagGCGaGuCaaGGuCu AAAUUGCU	4330

Table 40

2663	AUCCCAAU G UUACUAAA	1651	UUUAGUAA GCcgaaagGCGaGuCaaGGuCu AUUGGGAU	4331
2717	CAGAGUAU G UAGUUAAU	1652	AUUAACUA GCcgaaagGCGaGuCaaGGuCu AUACUCUG	4332
2901	AUCUUUCU G UCCCCAAU	1653	AUUGGGGA GCcgaaagGCGaGuCaaGGuCu AGAAAGAU	4333
3071	GGGGGACU G UUGGGGUG	1654	CACCCCAA GCcgaaagGCGaGuCaaGGuCu AGUCCCCC	4334
3111	UCACAACU G UGCCAGCA	1655	UGCUGGCA GCcgaaagGCGaGuCaaGGuCu AGUUGUGA	4335
40	AUCCCAGA G UCAGGGCC	1656	GGCCCUGA GCcgaaagGCGaGuCaaGGuCu UCUGGGAU	4336
46	GAGUCAGG G CCCUGUAC	1657	GUACAGGG GCcgaaagGCGaGuCaaGGuCu CCUGACUC	4337
65	UCCUGCUG G UGGCUCCA	1658	UGGAGCCA GCcgaaagGCGaGuCaaGGuCu CAGCAGGA	4338
68	UGCUGGUG G CUCCAGUU	1659	AACUGGAG GCcgaaagGCGaGuCaaGGuCu CACCAGCA	4339
74	UGGCUCCA G UUCAGGAA	1660	UUCCUGAA GCcgaaagGCGaGuCaaGGuCu UGGAGCCA	4340
85	CAGGAACA G UGAGCCCU	1661	AGGGCUCA GCcgaaagGCGaGuCaaGGuCu UGUUCCUG	4341
89	AACAGUGA G CCCUGCUC	1662	GAGCAGGG GCcgaaagGCGaGuCaaGGuCu UCACUGUU	4342
120	GCCAUAUC G UCAAUCUU	1663	AAGAUUGA GCcgaaagGCGaGuCaaGGuCu GAUAUGGC	4343
196	CCCUGCUC G UGUUACAG	1664	CUGUAACA GCcgaaagGCGaGuCaaGGuCu GAGCAGGG	4344
205	UGUUACAG G CGGGGUUU	1665	AAACCCCG GCcgaaagGCGaGuCaaGGuCu CUGUAACA	4345
210	CAGGCGGG G UUUUUCUU	1666	AAGAAAAA GCcgaaagGCGaGuCaaGGuCu CCCGCCUG	4346
248	ACCACAGA G UCUAGACU	1667	AGUCUAGA GCcgaaagGCGaGuCaaGGuCu UCUGUGGU	4347
258	CUAGACUC G UGGUGGAC	1668	GUCCACCA GCcgaaagGCGaGuCaaGGuCu GAGUCUAG	4348
261	GACUCGUG G UGGACUUC	1669	GAAGUCCA GCcgaaagGCGaGuCaaGGuCu CACGAGUC	4349
295	GAACACCC G UGUGUCUU	1670	AAGACACA GCcgaaagGCGaGuCaaGGuCu GGGUGUUC	4350
305	GUGUCUUG G CCAAAAUU	1671	AAUUUUGG GCcgaaagGCGaGuCaaGGuCu CAAGACAC	4351
318	AAUUCGCA G UCCCAAAU	1672	AUUUGGGA GCcgaaagGCGaGuCaaGGuCu UGCGAAUU	4352
332	AAUCUCCA G UCACUCAC	1673	GUGAGUGA GCcgaaagGCGaGuCaaGGuCu UGGAGAUU	4353
368	UUGUCCUG G UUAUCGCU	1674	AGCGAUAA GCcgaaagGCGaGuCaaGGuCu CAGGACAA	4354
390	UGUCUGCG G CGUUUUAU	1675	AUAAAACG GCcgaaagGCGaGuCaaGGuCu CGCAGACA	4355
392	UCUGCGGC G UUUUAUCA	1676	UGAUAAAA GCcgaaagGCGaGuCaaGGuCu GCCGCAGA	4356
442	UCUUGUUG G UUCUUCUG	1677	CAGAAGAA GCcgaaagGCGaGuCaaGGuCu CAACAAGA	4357
461	CUAUCAAG G UAUGUUGC	1678	GCAACAUA GCcgaaagGCGaGuCaaGGuCu CUUGAUAG	4358
472	UGUUGCCC G UUUGUCCU	1679	AGGACAAA GCcgaaagGCGaGuCaaGGuCu GGGCAACA	4359
506	AACAACCA G CACCGGAC	1680	GUCCGGUG GCcgaaagGCGaGuCaaGGuCu UGGUUGUU	4360
625	CAUCUUGG G CUUUCGCA	1681	UGCGAAAG GCcgaaagGCGaGuCaaGGuCu CCAAGAUG	4361
648	CUAUGGGA G UGGGCCUC	1682	GAGGCCCA GCcgaaagGCGaGuCaaGGuCu UCCCAUAG	4362
652	GGGAGUGG G CCUCAGUC	1683	GACUGAGG GCcgaaagGCGaGuCaaGGuCu CCACUCCC	4363
658	GGGCCUCA G UCCGUUUC	1684	GAAACGGA GCcgaaagGCGaGuCaaGGuCu UGAGGCCC	4364

Table 40

662	CUCAGUCC G UUUCUCUU	1685	AAGAGAAA GCcgaaagGCGaGuCaaGGuCu GGACUGAG	4365
672	UUCUCUUG G CUCAGUUU	1686	AAACUGAG GCcgaaagGCGaGuCaaGGuCu CAAGAGAA	4366
677	UUGGCUCA G UUUACUAG	1687	CUAGUAAA GCcgaaagGCGaGuCaaGGuCu UGAGCCAA	4367
685	GUUUACUA G UGCCAUUU	1688	AAAUGGCA GCcgaaagGCGaGuCaaGGuCu UAGUAAAC	4368
699	UUUGUUCA G UGGUUCGU	1689	ACGAACCA GCcgaaagGCGaGuCaaGGuCu UGAACAAA	4369
702	GUUCAGUG G UUCGUAGG	1690	CCUACGAA GCcgaaagGCGaGuCaaGGuCu CACUGAAC	4370
706	AGUGGUUC G UAGGGCUU	1691	AAGCCCUA GCcgaaagGCGaGuCaaGGuCu GAACCACU	4371
711	UUCGUAGG G CUUUCCCC	1692	GGGGAAAG GCcgaaagGCGaGuCaaGGuCu CCUACGAA	4372
729	ACUGUCUG G CUUUCAGU	1693	ACUGAAAG GCcgaaagGCGaGuCaaGGuCu CAGACAGU	4373
736	GGCUUUCA G UUAUAUGG	1694	CCAUAUAA GCcgaaagGCGaGuCaaGGuCu UGAAAGCC	4374
753	AUGAUGUG G UUUUGGGG	1695	CCCCAAAA GCcgaaagGCGaGuCaaGGuCu CACAUCAU	4375
762	UUUUGGGG G CCAAGUCU	1696	AGACUUGG GCcgaaagGCGaGuCaaGGuCu CCCCAAAA	4376
767	GGGGCCAA G UCUGUACA	1697	UGUACAGA GCcgaaagGCGaGuCaaGGuCu UUGGCCCC	4377
785	CAUCUUGA G UCCCUUUA	1698	UAAAGGGA GCcgaaagGCGaGuCaaGGuCu UCAAGAUG	4378
826	GUCUUUGG G UAUACAUU	1699	AAUGUAUA GCcgaaagGCGaGuCaaGGuCu CCAAAGAC	4379
898	AAUUGGGA G UUGGGGCA	1700	UGCCCCAA GCcgaaagGCGaGuCaaGGuCu UCCCAAUU	4380
904	GAGUUGGG G CACAUUGC	1701	GCAAUGUG GCcgaaagGCGaGuCaaGGuCu CCCAACUC	4381
971	GUAAACAG G CCUAUUGA	1702	UCAAUAGG GCcgaaagGCGaGuCaaGGuCu CUGUUUAC	4382
987	AUUGGAAA G UAUGUCAA	1703	UUGACAUA GCcgaaagGCGaGuCaaGGuCu UUUCCAAU	4383
1006	AAUUGUGG G UCUUUUGG	1704	CCAAAAGA GCcgaaagGCGaGuCaaGGuCu CCACAAUU	4384
1016	CUUUUGGG G UUUGCCGC	1705	GCGGCAAA GCcgaaagGCGaGuCaaGGuCu CCCAAAAG	4385
1080	GCAUACAA G CAAAACAG	1706	CUGUUUUG GCcgaaagGCGaGuCaaGGuCu UUGUAUGC	4386
1089	CAAAACAG G CUUUUACU	1707	AGUAAAAG GCcgaaagGCGaGuCaaGGuCu CUGUUUUG	4387
1116	CUUACAAG G CCUUUCUA	1708	UAGAAAGG GCcgaaagGCGaGuCaaGGuCu CUUGUAAG	4388
1126	CUUUCUAA G UAAACAGU	1709	ACUGUUUA GCcgaaagGCGaGuCaaGGuCu UUAGAAAG	4389
1133	AGUAAACA G UAUGUGAA	1710	UUCACAUA GCcgaaagGCGaGuCaaGGuCu UGUUUACU	4390
1152	UUUACCCC G UUGCUCGG	1711	CCGAGCAA GCcgaaagGCGaGuCaaGGuCu GGGGUAAA	4391
1160	GUUGCUCG G CAACGGCC	1712	GGCCGUUG GCcgaaagGCGaGuCaaGGuCu CGAGCAAC	4392
1166	CGGCAACG G CCUGGUCU	1713	AGACCAGG GCcgaaagGCGaGuCaaGGuCu CGUUGCCG	4393
1171	ACGGCCUG G UCUAUGCC	1714	GGCAUAGA GCcgaaagGCGaGuCaaGGuCu CAGGCCGU	4394
1182	UAUGCCAA G UGUUUGCU	1715	AGCAAACA GCcgaaagGCGaGuCaaGGuCu UUGGCAUA	4395
1207	CCCCACUG G UUGGGGCU	1716	AGCCCCAA GCcgaaagGCGaGuCaaGGuCu CAGUGGGG	4396
1213	UGGUUGGG G CUUGGCCA	1717	UGGCCAAG GCcgaaagGCGaGuCaaGGuCu CCCAACCA	4397
1218	GGGGCUUG G CCAUAGGC	1718	GCCUAUGG GCcgaaagGCGaGuCaaGGuCu CAAGCCCC	4398

Table 40

1225	GGCCAUAG G CCAUCAGC	1719	GCUGAUGG GCcgaaagGCGaGuCaaGGuCu CUAUGGCC	4399
1232	GGCCAUCA G CGCAUGCG	1720	CGCAUGCG GCcgaaagGCGaGuCaaGGuCu UGAUGGCC	4400
1240	GCGCAUGC G UGGAACCU	1721	AGGUUCCA GCcgaaagGCGaGuCaaGGuCu GCAUGCGC	4401
1287	AACUCCUA G CCGCUUGU	1722	ACAAGCGG GCcgaaagGCGaGuCaaGGuCu UAGGAGUU	4402
1306	UGCUCGCA G CAGGUCUG	1723	CAGACCUG GCcgaaagGCGaGuCaaGGuCu UGCGAGCA	4403
1310	CGCAGCAG G UCUGGGGC	1724	GCCCCAGA GCcgaaagGCGaGuCaaGGuCu CUGCUGCG	4404
1317	GGUCUGGG G CAAAACUC	1725	GAGUUUUG GCcgaaagGCGaGuCaaGGuCu CCCAGACC	4405
1347	AUUCUGUC G UGCUCUCC	1726	GGAGAGCA GCcgaaagGCGaGuCaaGGuCu GACAGAAU	4406
1379	UUUCCAUG G CUGCUAGG	1727	CCUAGCAG GCcgaaagGCGaGuCaaGGuCu CAUGGAAA	4407
1387	GCUGCUAG G CUGUGCUG	1728	CAGCACAG GCcgaaagGCGaGuCaaGGuCu CUAGCAGC	4408
1418	CGCGGGAC G UCCUUUGU	1729	ACAAAGGA GCcgaaagGCGaGuCaaGGuCu GUCCCGCG	4409
1431	UUGUUUAC G UCCCGUCG	1730	CGACGGGA GCcgaaagGCGaGuCaaGGuCu GUAAACAA	4410
1436	UACGUCCC G UCGGCGCU	1731	AGCGCCGA GCcgaaagGCGaGuCaaGGuCu GGGACGUA	4411
1440	UCCCGUCG G CGCUGAAU	1732	AUUCAGCG GCcgaaagGCGaGuCaaGGuCu CGACGGGA	4412
1471	CUCCCGGG G CCGCUUGG	1733	CCAAGCGG GCcgaaagGCGaGuCaaGGuCu CCCGGGAG	4413
1481	CGCUUGGG G CUCUACCG	1734	CGGUAGAG GCcgaaagGCGaGuCaaGGuCu CCCAAGCG	4414
1517	UACCGACC G UCCACGGG	1735	CCCGUGGA GCcgaaagGCGaGuCaaGGuCu GGUCGGUA	4415
1526	UCCACGGG G CGCACCUC	1736	GAGGUGCG GCcgaaagGCGaGuCaaGGuCu CCCGUGGA	4416
1553	GACUCCCC G UCUGUGCC	1737	GGCACAGA GCcgaaagGCGaGuCaaGGuCu GGGGAGUC	4417
1579	GCCGGACC G UGUGCACU	1738	AGUGCACA GCcgaaagGCGaGuCaaGGuCu GGUCCGGC	4418
1605	CUCUGCAC G UCGCAUGG	1739	CCAUGCGA GCcgaaagGCGaGuCaaGGuCu GUGCAGAG	4419
1622	AGACCACC G UGAACGCC	1740	GGCGUUCA GCcgaaagGCGaGuCaaGGuCu GGUGGUCU	4420
1649	UGCCCAAG G UCUUGCAU	1741	AUGCAAGA GCcgaaagGCGaGuCaaGGuCu CUUGGGCA	4421
1679	GACUUUCA G CAAUGUCA	1742	UGACAUUG GCcgaaagGCGaGuCaaGGuCu UGAAAGUC	4422
1703	ACCUUGAG G CAUACUUC	1743	GAAGUAUG GCcgaaagGCGaGuCaaGGuCu CUCAAGGU	4423
1732	UUUAAUGA G UGGGAGGA	1744	UCCUCCCA GCcgaaagGCGaGuCaaGGuCu UCAUUAAA	4424
1741	UGGGAGGA G UUGGGGGA	1745	UCCCCCAA GCcgaaagGCGaGuCaaGGuCu UCCUCCCA	4425
1754	GGGAGGAG G UUAGGUUA	1746	UAACCUAA GCcgaaagGCGaGuCaaGGuCu CUCCUCCC	4426
1759	GAGGUUAG G UUAAAGGU	1747	ACCUUUAA GCcgaaagGCGaGuCaaGGuCu CUAACCUC	4427
1766	GGUUAAAG G UCUUUGUA	1748	UACAAAGA GCcgaaagGCGaGuCaaGGuCu CUUUAACC	4428
1782	ACUAGGAG G CUGUAGGC	1749	GCCUACAG GCcgaaagGCGaGuCaaGGuCu CUCCUAGU	4429
1789	GGCUGUAG G CAUAAAUU	1750	AAUUUAUG GCcgaaagGCGaGuCaaGGuCu CUACAGCC	4430
1799	AUAAAUUG G UGUGUUCA	1751	UGAACACA GCcgaaagGCGaGuCaaGGuCu CAAUUUAU	4431
1811	GUUCACCA G CACCAUGC	1752	GCAUGGUG GCcgaaagGCGaGuCaaGGuCu UGGUGAAC	4432

Table 40

1870	CUGUUCAA G CCUCCAAG	1753	CUUGGAGG GCcgaaagGCGaGuCaaGGuCu UUGAACAG	4433
1878	GCCUCCAA G CUGUGCCU	1754	AGGCACAG GCcgaaagGCGaGuCaaGGuCu UUGGAGGC	4434
1890	UGCCUUGG G UGGCUUUG	1755	CAAAGCCA GCcgaaagGCGaGuCaaGGuCu CCAAGGCA	4435
1893	CUUGGGUG G CUUUGGGG	1756	CCCCAAAG GCcgaaagGCGaGuCaaGGuCu CACCCAAG	4436
1901	GCUUUGGG G CAUGGACA	1757	UGUCCAUG GCcgaaagGCGaGuCaaGGuCu CCCAAAGC	4437
1917	AUUGACCC G UAUAAAGA	1758	UCUUUAUA GCcgaaagGCGaGuCaaGGuCu GGGUCAAU	4438
1933	AAUUUGGA G CUUCUGUG	1759	CACAGAAG GCcgaaagGCGaGuCaaGGuCu UCCAAAUU	4439
1944	UCUGUGGA G UUACUCUC	1760	GAGAGUAA GCcgaaagGCGaGuCaaGGuCu UCCACAGA	4440
2023	AUCGGGGG G CCUUAGAG	1761	CUCUAAGG GCcgaaagGCGaGuCaaGGuCu CCCCCGAU	4441
2031	GCCUUAGA G UCUCCGGA	1762	UCCGGAGA GCcgaaagGCGaGuCaaGGuCu UCUAAGGC	4442
2062	ACCAUACG G CACUCAGG	1763	CCUGAGUG GCcgaaagGCGaGuCaaGGuCu CGUAUGGU	4443
2070	GCACUCAG G CAAGCUAU	1764	AUAGCUUG GCcgaaagGCGaGuCaaGGuCu CUGAGUGC	4444
2074	UCAGGCAA G CUAUUCUG	1765	CAGAAUAG GCcgaaagGCGaGuCaaGGuCu UUGCCUGA	4445
2090	GUGUUGGG G UGAGUUGA	1766	UCAACUCA GCcgaaagGCGaGuCaaGGuCu CCCAACAC	4446
2094	UGGGGUGA G UUGAUGAA	1767	UUCAUCAA GCcgaaagGCGaGuCaaGGuCu UCACCCCA	4447
2107	UGAAUCUA G CCACCUGG	1768	CCAGGUGG GCcgaaagGCGaGuCaaGGuCu UAGAUUCA	4448
2116	CCACCUGG G UGGGAAGU	1769	ACUUCCCA GCcgaaagGCGaGuCaaGGuCu CCAGGUGG	4449
2123	GGUGGGAA G UAAUUUGG	1770	CCAAAUUA GCcgaaagGCGaGuCaaGGuCu UUCCCACC	4450
2140	AAGAUCCA G CAUCCAGG	1771	CCUGGAUG GCcgaaagGCGaGuCaaGGuCu UGGAUCUU	4451
2155	GGGAAUUA G UAGUCAGC	1772	GCUGACUA GCcgaaagGCGaGuCaaGGuCu UAAUUCCC	4452
2158	AAUUAGUA G UCAGCUAU	1773	AUAGCUGA GCcgaaagGCGaGuCaaGGuCu UACUAAUU	4453
2162	AGUAGUCA G CUAUGUCA	1774	UGACAUAG GCcgaaagGCGaGuCaaGGuCu UGACUACU	4454
2173	AUGUCAAC G UUAAUAUG	1775	CAUAUUAA GCcgaaagGCGaGuCaaGGuCu GUUGACAU	4455
2183	UAAUAUGG G CCUAAAAA	1776	UUUUUAGG GCcgaaagGCGaGuCaaGGuCu CCAUAUUA	4456
2208	CUAUUGUG G UUUCACAU	1777	AUGUGAAA GCcgaaagGCGaGuCaaGGuCu CACAAUAG	4457
2235	ACUUUUGG G CGAGAAAC	1778	GUUUCUCG GCcgaaagGCGaGuCaaGGuCu CCAAAAGU	4458
2260	AAUAUUUG G UGUCUUUU	1779	AAAAGACA GCcgaaagGCGaGuCaaGGuCu CAAAUAUU	4459
2272	CUUUUGGA G UGUGGAUU	1780	AAUCCACA GCcgaaagGCGaGuCaaGGuCu UCCAAAAG	4460
2360	ACGAAGAG G CAGGUCCC	1781	GGGACCUG GCcgaaagGCGaGuCaaGGuCu CUCUUCGU	4461
2364	AGAGGCAG G UCCCCUAG	1782	CUAGGGGA GCcgaaagGCGaGuCaaGGuCu CUGCCUCU	4462
2403	AGACGAAG G UCUCAAUC	1783	GAUUGAGA GCcgaaagGCGaGuCaaGGuCu CUUCGUCU	4463
2417	AUCGCCGC G UCGCAGAA	1784	UUCUGCGA GCcgaaagGCGaGuCaaGGuCu GCGGCGAU	4464
2454	CAAUGUUA G UAUUCCUU	1785	AAGGAAUA GCcgaaagGCGaGuCaaGGuCu UAACAUUG	4465
2474	CACAUAAG G UGGGAAAC	1786	GUUUCCCA GCcgaaagGCGaGuCaaGGuCu CUUAUGUG	4466

Table 40

2491	UUUACGGG G CUUUAUUC	1787	GAAUAAAG GCcgaaagGCGaGuCaaGGuCu CCCGUAAA	4467
2507	CUUCUACG G UACCUUGC	1788	GCAAGGUA GCcgaaagGCGaGuCaaGGuCu CGUAGAAG	4468
2530	CCUAAAUG G CAAACUCC	1789	GGAGUUUG GCcgaaagGCGaGuCaaGGuCu CAUUUAGG	4469
2587	AGAUGUAA G CAAUUUGU	1790	ACAAAUUG GCcgaaagGCGaGuCaaGGuCu UUACAUCU	4470
2599	UUUGUGGG G CCCCUUAC	1791	GUAAGGGG GCcgaaagGCGaGuCaaGGuCu CCCACAAA	4471
2609	CCCUUACA G UAAAUGAA	1792	UUCAUUUA GCcgaaagGCGaGuCaaGGuCu UGUAAGGG	4472
2650	CCUGCUAG G UUUUAUCC	1793	GGAUAAAA GCcgaaagGCGaGuCaaGGuCu CUAGCAGG	4473
2701	AUCAAACC G UAUUAUCC	1794	GGAUAAUA GCcgaaagGCGaGuCaaGGuCu GGUUUGAU	4474
2713	UAUCCAGA G UAUGUAGU	1795	ACUACAUA GCcgaaagGCGaGuCaaGGuCu UCUGGAUA	4475
2720	AGUAUGUA G UUAAUCAU	1796	AUGAUUAA GCcgaaagGCGaGuCaaGGuCu UACAUACU	4476
2768	UUUGGAAG G CGGGGAUC	1797	GAUCCCCG GCcgaaagGCGaGuCaaGGuCu CUUCCAAA	4477
2791	AAAAGAGA G UCCACACG	1798	CGUGUGGA GCcgaaagGCGaGuCaaGGuCu UCUCUUUU	4478
2799	GUCCACAC G UAGCGCCU	1799	AGGCGCUA GCcgaaagGCGaGuCaaGGuCu GUGUGGAC	4479
2802	CACACGUA G CGCCUCAU	1800	AUGAGGCG GCcgaaagGCGaGuCaaGGuCu UACGUGUG	4480
2818	UUUUGCGG G UCACCAUA	1801	UAUGGUGA GCcgaaagGCGaGuCaaGGuCu CCGCAAAA	4481
2848	GAUCUACA G CAUGGGAG	1802	CUCCCAUG GCcgaaagGCGaGuCaaGGuCu UGUAGAUC	4482
2857	CAUGGGAG G UUGGUCUU	1803	AAGACCAA GCcgaaagGCGaGuCaaGGuCu CUCCCAUG	4483
2861	GGAGGUUG G UCUUCCAA	1804	UUGGAAGA GCcgaaagGCGaGuCaaGGuCu CAACCUCC	4484
2881	UCGAAAAG G CAUGGGGA	1805	UCCCCAUG GCcgaaagGCGaGuCaaGGuCu CUUUUCGA	4485
2936	GAUCAUCA G UUGGACCC	1806	GGGUCCAA GCcgaaagGCGaGuCaaGGuCu UGAUGAUC	4486
2955	CAUUCAAA G CCAACUCA	1807	UGAGUUGG GCcgaaagGCGaGuCaaGGuCu UUUGAAUG	4487
2964	CCAACUCA G UAAAUCCA	1808	UGGAUUUA GCcgaaagGCGaGuCaaGGuCu UGAGUUGG	4488
3005	GACAACUG G CCGGACGC	1809	GCGUCCGG GCcgaaagGCGaGuCaaGGuCu CAGUUGUC	4489
3021	CCAACAAG G UGGGAGUG	1810	CACUCCCA GCcgaaagGCGaGuCaaGGuCu CUUGUUGG	4490
3027	AGGUGGGA G UGGGAGCA	1811	UGCUCCCA GCcgaaagGCGaGuCaaGGuCu UCCCACCU	4491
3033	GAGUGGGA G CAUUCGGG	1812	CCCGAAUG GCcgaaagGCGaGuCaaGGuCu UCCCACUC	4492
3041	GCAUUCGG G CCAGGGUU	1813	AACCCUGG GCcgaaagGCGaGuCaaGGuCu CCGAAUGC	4493
3047	GGGCCAGG G UUCACCCC	1814	GGGGUGAA GCcgaaagGCGaGuCaaGGuCu CCUGGCCC	4494
3077	CUGUUGGG G UGGAGCCC	1815	GGGCUCCA GCcgaaagGCGaGuCaaGGuCu CCCAACAG	4495
3082	GGGGUGGA G CCCUCACG	1816	CGUGAGGG GCcgaaagGCGaGuCaaGGuCu UCCACCCC	4496
3097	CGCUCAGG G CCUACUCA	1817	UGAGUAGG GCcgaaagGCGaGuCaaGGuCu CCUGAGCG	4497
3117	CUGUGCCA G CAGCUCCU	1818	AGGAGCUG GCcgaaagGCGaGuCaaGGuCu UGGCACAG	4498
3120	UGCCAGCA G CUCCUCCU	1819	AGGAGGAG GCcgaaagGCGaGuCaaGGuCu UGCUGGCA	4499
3146	ACCAAUCG G CAGUCAGG	1820	CCUGACUG GCcgaaagGCGaGuCaaGGuCu CGAUUGGU	4500

Table 40

3149	AAUCGGCA G UCAGGAAG	1821	CUUCCUGA GCcgaaagGCGaGuCaaGGuCu UGCCGAUU	4501
3158	UCAGGAAG G CAGCCUAC	1822	GUAGGCUG GCcgaaagGCGaGuCaaGGuCu CUUCCUGA	4502
3161	GGAAGGCA G CCUACUCC	1823	GGAGUAGG GCcgaaagGCGaGuCaaGGuCu UGCCUUCC	4503
3204	AUCCUCAG G CCAUGCAG	1824	CUGCAUGG GCcgaaagGCGaGuCaaGGuCu CUGAGGAU	4504

Input Sequence = AF100308. Cut Site = YG/M or UG/U.
Stem Length = 8 . Core Sequence = GCcgaaagGCGaGuCaaGGuCu
AF100308 (Hepatitis B virus strain 2-18, 3215 bp)

Table 41

Table 41: Human HBV DNAzyme and Substrate Sequence

Pos	Substrate	Seq ID	DNAzyme	Rz Seq ID
508	CAACCAGC A CCGGACCA	833	TGGTCCGG GGCTAGCTACAACGA GCTGGTTG	4505
1632	GAACGCCC A CAGGAACC	1096	GGTTCCTG GGCTAGCTACAACGA GGGCGTTC	4506
2992	CAACCCGC A CAAGGACA	1376	TGTCCTTG GGCTAGCTACAACGA GCGGGTTG	4507
61	ACUUUCCU G CUGGUGGC	1448	GCCACCAG GGCTAGCTACAACGA AGGAAAGT	4508
94	UGAGCCCU G CUCAGAAU	1450	ATTCTGAG GGCTAGCTACAACGA AGGGCTCA	4509
112	CUGUCUCU G CCAUAUCG	1451	CGATATGG GGCTAGCTACAACGA AGAGACAG	4510
169	AGAACAUC G CAUCAGGA	1454	TCCTGATG GGCTAGCTACAACGA GATGTTCT	4511
192	GGACCCCU G CUCGUGUU	1455	AACACGAG GGCTAGCTACAACGA AGGGGTCC	4512
315	CAAAAUUC G CAGUCCCA	1457	TGGGACTG GGCTAGCTACAACGA GAATTTTG	4513
374	UGGUUAUC G CUGGAUGU	1458	ACATCCAG GGCTAGCTACAACGA GATAACCA	4514
387	AUGUGUCU G CGGCGUUU	1459	AAACGCCG GGCTAGCTACAACGA AGACACAT	4515
410	CUUCCUCU G CAUCCUGC	1460	GCAGGATG GGCTAGCTACAACGA AGAGGAAG	4516
417	UGCAUCCU G CUGCUAUG	1461	CATAGCAG GGCTAGCTACAACGA AGGATGCA	4517
420	AUCCUGCU G CUAUGCCU	1462	AGGCATAG GGCTAGCTACAACGA AGCAGGAT	4518
425	GCUGCUAU G CCUCAUCU	1463	AGATGAGG GGCTAGCTACAACGA ATAGCAGC	4519
468	GGUAUGUU G CCCGUUUG	1464	CAAACGGG GGCTAGCTACAACGA AACATACC	4520
518	CGGACCAU G CAAAACCU	1465	AGGTTTTG GGCTAGCTACAACGA ATGGTCCG	4521
527	CAAAACCU G CACAACUC	1466	GAGTTGTG GGCTAGCTACAACGA AGGTTTTG	4522
538	CAACUCCU G CUCAAGGA	1467	TCCTTGAG GGCTAGCTACAACGA AGGAGTTG	4523
569	CUCAUGUU G CUGUACAA	1468	TTGTACAG GGCTAGCTACAACGA AACATGAG	4524
596	CGGAAACU G CACCUGUA	1469	TACAGGTG GGCTAGCTACAACGA AGTTTCCG	4525
631	GGGCUUUC G CAAAAUAC	1470	GTATTTTG GGCTAGCTACAACGA GAAAGCCC	4526
687	UUACUAGU G CCAUUUGU	1471	ACAAATGG GGCTAGCTACAACGA ACTAGTAA	4527
795	CCCUUUAU G CCGCUGUU	1474	AACAGCGG GGCTAGCTACAACGA ATAAAGGG	4528
798	UUUAUGCC G CUGUUACC	1475	GGTAACAG GGCTAGCTACAACGA GGCATAAA	4529
911	GGCACAUU G CCACAGGA	1476	TCCTGTGG GGCTAGCTACAACGA AATGTGCC	4530
1020	UGGGGUUU G CCGCCCCU	1479	AGGGGCGG GGCTAGCTACAACGA AAACCCCA	4531
1023	GGUUUGCC G CCCCUUUC	1480	GAAAGGGG GGCTAGCTACAACGA GGCAAACC	4532
1034	CCUUUCAC G CAAUGUGG	1481	CCACATTG GGCTAGCTACAACGA GTGAAAGG	4533
1050	GAUAUUCU G CUUUAAUG	1482	CATTAAAG GGCTAGCTACAACGA AGAATATC	4534
1058	GCUUUAAU G CCUUUAUA	1483	TATAAAGG GGCTAGCTACAACGA ATTAAAGC	4535
1068	CUUUAUAU G CAUGCAUA	1484	TATGCATG GGCTAGCTACAACGA ATATAAAG	4536
1072	AUAUGCAU G CAUACAAG	1485	CTTGTATG GGCTAGCTACAACGA ATGCATAT	4537
1103	ACUUUCUC G CCAACUUA	1486	TAAGTTGG GGCTAGCTACAACGA GAGAAAGT	4538
1155	ACCCCGUU G CUCGGCAA	1488	TTGCCGAG GGCTAGCTACAACGA AACGGGGT	4539
1177	UGGUCUAU G CCAAGUGU	1489	ACACTTGG GGCTAGCTACAACGA ATAGACCA	4540
1188	AAGUGUUU G CUGACGCA	1490	TGCGTCAG GGCTAGCTACAACGA AAACACTT	4541
1194	UUGCUGAC G CAACCCCC	1492	GGGGGTTG GGCTAGCTACAACGA GTCAGCAA	4542
1234	CCAUCAGC G CAUGCGUG	1493	CACGCATG GGCTAGCTACAACGA GCTGATGG	4543
1238	CAGCGCAU G CGUGGAAC	1494	GTTCCACG GGCTAGCTACAACGA ATGCGCTG	4544
1262	UCUCCUCU G CCGAUCCA	1495	TGGATCGG GGCTAGCTACAACGA AGAGGAGA	4545
1275	UCCAUACC G CGGAACUC	1497	GAGTTCCG GGCTAGCTACAACGA GGTATGGA	4546
1290	UCCUAGCC G CUUGUUUU	1498	AAAACAAG GGCTAGCTACAACGA GGCTAGGA	4547
1299	CUUGUUUU G CUCGCAGC	1499	GCTGCGAG GGCTAGCTACAACGA AAAACAAG	4548
1303	UUUUGCUC G CAGCAGGU	1500	ACCTGCTG GGCTAGCTACAACGA GAGCAAAA	4549
1349	UCUGUCGU G CUCUCCCG	1502	CGGGAGAG GGCTAGCTACAACGA ACGACAGA	4550
1357	GCUCUCCC G CAAAUAUA	1503	TATATTTG GGCTAGCTACAACGA GGGAGAGC	4551

Table 41

1382	CCAUGGCU G CUAGGCUG	1504	CAGCCTAG GGCTAGCTACAACGA AGCCATGG	4552
1392	UAGGCUGU G CUGCCAAC	1505	GTTGGCAG GGCTAGCTACAACGA ACAGCCTA	4553
1395	GCUGUGCU G CCAACUGG	1506	CCAGTTGG GGCTAGCTACAACGA AGCACAGC	4554
1411	GAUCCUAC G CGGGACGU	1507	ACGTCCCG GGCTAGCTACAACGA GTAGGATC	4555
1442	CCGUCGGC G CUGAAUCC	1508	GGATTCAG GGCTAGCTACAACGA GCCGACGG	4556
1452	UGAAUCCC G CGGACGAC	1510	GTCGTCCG GGCTAGCTACAACGA GGGATTCA	4557
1474	CCGGGGCC G CUUGGGGC	1512	GCCCCAAG GGCTAGCTACAACGA GGCCCCGG	4558
1489	GCUCUACC G CCCGCUUC	1513	GAAGCGGG GGCTAGCTACAACGA GGTAGAGC	4559
1493	UACCGCCC G CUUCUCCG	1514	CGGAGAAG GGCTAGCTACAACGA GGGCGGTA	4560
1501	GCUUCUCC G CCUAUUGU	1515	ACAATAGG GGCTAGCTACAACGA GGAGAAGC	4561
1528	CACGGGGC G CACCUCUC	1517	GAGAGGTG GGCTAGCTACAACGA GCCCCGTG	4562
1542	CUCUUUAC G CGGACUCC	1518	GGAGTCCG GGCTAGCTACAACGA GTAAAGAG	4563
1559	CCGUCUGU G CCUUCUCA	1519	TGAGAAGG GGCTAGCTACAACGA ACAGACGG	4564
1571	UCUCAUCU G CCGGACCG	1520	CGGTCCGG GGCTAGCTACAACGA AGATGAGA	4565
1583	GACCGUGU G CACUUCGC	1521	GCGAAGTG GGCTAGCTACAACGA ACACGGTC	4566
1590	UGCACUUC G CUUCACCU	1522	AGGTGAAG GGCTAGCTACAACGA GAAGTGCA	4567
1601	UCACCUCU G CACGUCGC	1523	GCGACGTG GGCTAGCTACAACGA AGAGGTGA	4568
1608	UGCACGUC G CAUGGAGA	1524	TCTCCATG GGCTAGCTACAACGA GACGTGCA	4569
1628	CCGUGAAC G CCCACAGG	1526	CCTGTGGG GGCTAGCTACAACGA GTTCACGG	4570
1642	AGGAACCU G CCCAAGGU	1527	ACCTTGGG GGCTAGCTACAACGA AGGTTCCT	4571
1654	AAGGUCUU G CAUAAGAG	1528	CTCTTATG GGCTAGCTACAACGA AAGACCTT	4572
1818	AGCACCAU G CAACUUUU	1533	AAAAGTTG GGCTAGCTACAACGA ATGGTGCT	4573
1835	UCACCUCU G CCUAAUCA	1534	TGATTAGG GGCTAGCTACAACGA AGAGGTGA	4574
1883	CAAGCUGU G CCUUGGGU	1535	ACCCAAGG GGCTAGCTACAACGA ACAGCTTG	4575
1959	UCUUUUUU G CCUUCUGA	1537	TCAGAAGG GGCTAGCTACAACGA AAAAAAGA	4576
2002	UCGACACC G CCUCUGCU	1541	AGCAGAGG GGCTAGCTACAACGA GGTGTCGA	4577
2008	CCGCCUCU G CUCUGUAU	1542	ATACAGAG GGCTAGCTACAACGA AGAGGCGG	4578
2282	GUGGAUUC G CACUCCUC	1548	GAGGAGTG GGCTAGCTACAACGA GAATCCAC	4579
2293	CUCCUCCU G CAUAUAGA	1549	TCTATATG GGCTAGCTACAACGA AGGAGGAG	4580
2311	CACCAAAU G CCCCUAUC	1550	GATAGGGG GGCTAGCTACAACGA ATTTGGTG	4581
2388	ACUCCCUC G CCUCGCAG	1552	CTGCGAGG GGCTAGCTACAACGA GAGGGAGT	4582
2393	CUCGCCUC G CAGACGAA	1553	TTCGTCTG GGCTAGCTACAACGA GAGGCGAG	4583
2412	UCUCAAUC G CCGCGUCG	1555	CGACGCGG GGCTAGCTACAACGA GATTGAGA	4584
2415	CAAUCGCC G CGUCGCAG	1556	CTGCGACG GGCTAGCTACAACGA GGCGATTG	4585
2420	GCCGCGUC G CAGAAGAU	1557	ATCTTCTG GGCTAGCTACAACGA GACGCGGC	4586
2514	GGUACCUU G CUUUAAUC	1558	GATTAAAG GGCTAGCTACAACGA AAGGTACC	4587
2560	AUUCAUUU G CAGGAGGA	1560	TCCTCCTG GGCTAGCTACAACGA AAATGAAT	4588
2641	UUAACUAU G CCUGCUAG	1563	CTAGCAGG GGCTAGCTACAACGA ATAGTTAA	4589
2645	CUAUGCCU G CUAGGUUU	1564	AAACCTAG GGCTAGCTACAACGA AGGCATAG	4590
2677	AAAUAUUU G CCCUUAGA	1565	TCTAAGGG GGCTAGCTACAACGA AAATATTT	4591
2740	UUCCAGAC G CGACAUUA	1566	TAATGTCG GGCTAGCTACAACGA GTCTGGAA	4592
2804	CACGUAGC G CCUCAUUU	1568	AAATGAGG GGCTAGCTACAACGA GCTACGTG	4593
2814	CUCAUUUU G CGGGUCAC	1569	GTGACCCG GGCTAGCTACAACGA AAAATGAG	4594
2946	UGGACCCU G CAUUCAAA	1572	TTTGAATG GGCTAGCTACAACGA AGGGTCCA	4595
2990	CUCAACCC G CACAAGGA	1573	TCCTTGTG GGCTAGCTACAACGA GGGTTGAG	4596
3012	GGCCGGAC G CCAACAAG	1574	CTTGTTGG GGCTAGCTACAACGA GTCCGGCC	4597
3090	GCCCUCAC G CUCAGGGC	1575	GCCCTGAG GGCTAGCTACAACGA GTGAGGGC	4598
3113	ACAACUGU G CCAGCAGC	1576	GCTGCTGG GGCTAGCTACAACGA ACAGTTGT	4599
3132	CUCCUCCU G CCUCCACC	1577	GGTGGAGG GGCTAGCTACAACGA AGGAGGAG	4600
51	AGGGCCCU G UACUUUCC	1578	GGAAAGTA GGCTAGCTACAACGA AGGGCCCT	4601
106	AGAAUACU G UCUCUGCC	1579	GGCAGAGA GGCTAGCTACAACGA AGTATTCT	4602

Table 41

148	GGGACCCU G UACCGAAC	1580	GTTCGGTA GGCTAGCTACAACGA AGGGTCCC	4603
198	CUGCUCGU G UUACAGGC	1581	GCCTGTAA GGCTAGCTACAACGA ACGAGCAG	4604
219	UUUUUCUU G UUGACAAA	1582	TTTGTCAA GGCTAGCTACAACGA AAGAAAAA	4605
297	ACACCCGU G UGUCUUGG	1583	CCAAGACA GGCTAGCTACAACGA ACGGGTGT	4606
299	ACCCGUGU G UCUUGGCC	1584	GGCCAAGA GGCTAGCTACAACGA ACACGGGT	4607
347	ACCAACCU G UUGUCCUC	1585	GAGGACAA GGCTAGCTACAACGA AGGTTGGT	4608
350	AACCUGUU G UCCUCCAA	1586	TTGGAGGA GGCTAGCTACAACGA AACAGGTT	4609
362	UCCAAUUU G UCCUGGUU	1587	AACCAGGA GGCTAGCTACAACGA AAATTGGA	4610
381	CGCUGGAU G UGUCUGCG	1588	CGCAGACA GGCTAGCTACAACGA ATCCAGCG	4611
383	CUGGAUGU G UCUGCGGC	1589	GCCGCAGA GGCTAGCTACAACGA ACATCCAG	4612
438	AUCUUCUU G UUGGUUCU	1590	AGAACCAA GGCTAGCTACAACGA AAGAAGAT	4613
465	CAAGGUAU G UUGCCCGU	1591	ACGGGCAA GGCTAGCTACAACGA ATACCTTG	4614
476	GCCCGUUU G UCCUCUAA	1592	TTAGAGGA GGCTAGCTACAACGA AAACGGGC	4615
555	ACCUCUAU G UUUCCCUC	1593	GAGGGAAA GGCTAGCTACAACGA ATAGAGGT	4616
566	UCCCUCAU G UUGCUGUA	1594	TACAGCAA GGCTAGCTACAACGA ATGAGGGA	4617
572	AUGUUGCU G UACAAAAC	1595	GTTTTGTA GGCTAGCTACAACGA AGCAACAT	4618
602	CUGCACCU G UAUUCCCA	1596	TGGGAATA GGCTAGCTACAACGA AGGTGCAG	4619
694	UGCCAUUU G UUCAGUGG	1597	CCACTGAA GGCTAGCTACAACGA AAATGGCA	4620
724	CCCCCACU G UCUGGCUU	1598	AAGCCAGA GGCTAGCTACAACGA AGTGGGGG	4621
750	UGGAUGAU G UGGUUUUG	1599	CAAAACCA GGCTAGCTACAACGA ATCATCCA	4622
771	CCAAGUCU G UACAACAU	1600	ATGTTGTA GGCTAGCTACAACGA AGACTTGG	4623
801	AUGCCGCU G UUACCAAU	1601	ATTGGTAA GGCTAGCTACAACGA AGCGGCAT	4624
818	UUUCUUUU G UCUUUGGG	1602	CCCAAAGA GGCTAGCTACAACGA AAAAGAAA	4625
888	UGGGAUAU G UAAUUGGG	1603	CCCAATTA GGCTAGCTACAACGA ATATCCCA	4626
927	AACAUAUU G UACAAAAA	1604	TTTTTGTA GGCTAGCTACAACGA AATATGTT	4627
944	AUCAAAAU G UGUUUUAG	1605	CTAAAACA GGCTAGCTACAACGA ATTTTGAT	4628
946	CAAAAUGU G UUUUAGGA	1606	TCCTAAAA GGCTAGCTACAACGA ACATTTTG	4629
963	AACUUCCU G UAAACAGG	1607	CCTGTTTA GGCTAGCTACAACGA AGGAAGTT	4630
991	GAAAGUAU G UCAACGAA	1608	TTCGTTGA GGCTAGCTACAACGA ATACTTTC	4631
1002	AACGAAUU G UGGGUCUU	1609	AAGACCCA GGCTAGCTACAACGA AATTCGTT	4632
1039	CACGCAAU G UGGAUAUU	1610	AATATCCA GGCTAGCTACAACGA ATTGCGTG	4633
1137	AACAGUAU G UGAACCUU	1611	AAGGTTCA GGCTAGCTACAACGA ATACTGTT	4634
1184	UGCCAAGU G UUUGCUGA	1612	TCAGCAAA GGCTAGCTACAACGA ACTTGGCA	4635
1251	GAACCUUU G UGUCUCCU	1613	AGGAGACA GGCTAGCTACAACGA AAAGGTTC	4636
1253	ACCUUUGU G UCUCCUCU	1614	AGAGGAGA GGCTAGCTACAACGA ACAAAGGT	4637
1294	AGCCGCUU G UUUUGCUC	1615	GAGCAAAA GGCTAGCTACAACGA AAGCGGCT	4638
1344	ACAAUUCU G UCGUGCUC	1616	GAGCACGA GGCTAGCTACAACGA AGAATTGT	4639
1390	GCUAGGCU G UGCUGCCA	1617	TGGCAGCA GGCTAGCTACAACGA AGCCTAGC	4640
1425	CGUCCUUU G UUUACGUC	1618	GACGTAAA GGCTAGCTACAACGA AAAGGACG	4641
1508	CGCCUAUU G UACCGACC	1619	GGTCGGTA GGCTAGCTACAACGA AATAGGCG	4642
1557	CCCCGUCU G UGCCUUCU	1620	AGAAGGCA GGCTAGCTACAACGA AGACGGGG	4643
1581	CGGACCGU G UGCACUUC	1621	GAAGTGCA GGCTAGCTACAACGA ACGGTCCG	4644
1684	UCAGCAAU G UCAACGAC	1622	GTCGTTGA GGCTAGCTACAACGA ATTGCTGA	4645
1719	CAAAGACU G UGUGUUUA	1623	TAAACACA GGCTAGCTACAACGA AGTCTTTG	4646
1721	AAGACUGU G UGUUUAAU	1624	ATTAAACA GGCTAGCTACAACGA ACAGTCTT	4647
1723	GACUGUGU G UUUAAUGA	1625	TCATTAAA GGCTAGCTACAACGA ACACAGTC	4648
1772	AGGUCUUU G UACUAGGA	1626	TCCTAGTA GGCTAGCTACAACGA AAAGACCT	4649
1785	AGGAGGCU G UAGGCAUA	1627	TATGCCTA GGCTAGCTACAACGA AGCCTCCT	4650
1801	AAAUUGGU G UGUUCACC	1628	GGTGAACA GGCTAGCTACAACGA ACCAATTT	4651
1803	AUUGGUGU G UUCACCAG	1629	CTGGTGAA GGCTAGCTACAACGA ACACCAAT	4652
1850	CAUCUCAU G UUCAUGUC	1630	GACATGAA GGCTAGCTACAACGA ATGAGATG	4653

Table 41

1856	AUGUUCAU G UCCUACUG	1631	CAGTAGGA GGCTAGCTACAACGA ATGAACAT	4654
1864	GUCCUACU G UUCAAGCC	1632	GGCTTGAA GGCTAGCTACAACGA AGTAGGAC	4655
1881	UCCAAGCU G UGCCUUGG	1633	CCAAGGCA GGCTAGCTACAACGA AGCTTGGA	4656
1939	GAGCUUCU G UGGAGUUA	1634	TAACTCCA GGCTAGCTACAACGA AGAAGCTC	4657
2013	UCUGCUCU G UAUCGGGG	1635	CCCCGATA GGCTAGCTACAACGA AGAGCAGA	4658
2045	GGAACAUU G UUCACCUC	1636	GAGGTGAA GGCTAGCTACAACGA AATGTTCC	4659
2082	GCUAUUCU G UGUUGGGG	1637	CCCCAACA GGCTAGCTACAACGA AGAATAGC	4660
2084	UAUUCUGU G UUGGGGUG	1638	CACCCCAA GGCTAGCTACAACGA ACAGAATA	4661
2167	UCAGCUAU G UCAACGUU	1639	AACGTTGA GGCTAGCTACAACGA ATAGCTGA	4662
2205	CAACUAUU G UGGUUUCA	1640	TGAAACCA GGCTAGCTACAACGA AATAGTTG	4663
2222	CAUUUCCU G UCUUACUU	1641	AAGTAAGA GGCTAGCTACAACGA AGGAAATG	4664
2245	GAGAAACU G UUCUUGAA	1642	TTCAAGAA GGCTAGCTACAACGA AGTTTCTC	4665
2262	UAUUUGGU G UCUUUUGG	1643	CCAAAAGA GGCTAGCTACAACGA ACCAAATA	4666
2274	UUUGGAGU G UGGAUUCG	1644	CGAATCCA GGCTAGCTACAACGA ACTCCAAA	4667
2344	AAACUACU G UUGUUAGA	1645	TCTAACAA GGCTAGCTACAACGA AGTAGTTT	4668
2347	CUACUGUU G UUAGACGA	1646	TCGTCTAA GGCTAGCTACAACGA AACAGTAG	4669
2450	AUCUCAAU G UUAGUAUU	1647	AATACTAA GGCTAGCTACAACGA ATTGAGAT	4670
2573	AGGACAUU G UUGAUAGA	1648	TCTATCAA GGCTAGCTACAACGA AATGTCCT	4671
2583	UGAUAGAU G UAAGCAAU	1649	ATTGCTTA GGCTAGCTACAACGA ATCTATCA	4672
2594	AGCAAUUU G UGGGGCCC	1650	GGGCCCCA GGCTAGCTACAACGA AAATTGCT	4673
2663	AUCCCAAU G UUACUAAA	1651	TTTAGTAA GGCTAGCTACAACGA ATTGGGAT	4674
2717	CAGAGUAU G UAGUUAAU	1652	ATTAACTA GGCTAGCTACAACGA ATACTCTG	4675
2901	AUCUUUCU G UCCCCAAU	1653	ATTGGGGA GGCTAGCTACAACGA AGAAAGAT	4676
3071	GGGGGACU G UUGGGGUG	1654	CACCCCAA GGCTAGCTACAACGA AGTCCCCC	4677
3111	UCACAACU G UGCCAGCA	1655	TGCTGGCA GGCTAGCTACAACGA AGTTGTGA	4678
40	AUCCCAGA G UCAGGGCC	1656	GGCCCTGA GGCTAGCTACAACGA TCTGGGAT	4679
46	GAGUCAGG G CCCUGUAC	1657	GTACAGGG GGCTAGCTACAACGA CCTGACTC	4680
65	UCCUGCUG G UGGCUCCA	1658	TGGAGCCA GGCTAGCTACAACGA CAGCAGGA	4681
68	UGCUGGUG G CUCCAGUU	1659	AACTGGAG GGCTAGCTACAACGA CACCAGCA	4682
74	UGGCUCCA G UUCAGGAA	1660	TTCCTGAA GGCTAGCTACAACGA TGGAGCCA	4683
85	CAGGAACA G UGAGCCCU	1661	AGGGCTCA GGCTAGCTACAACGA TGTTCCTG	4684
89	AACAGUGA G CCCUGCUC	1662	GAGCAGGG GGCTAGCTACAACGA TCACTGTT	4685
120	GCCAUAUC G UCAAUCUU	1663	AAGATTGA GGCTAGCTACAACGA GATATGGC	4686
196	CCCUGCUC G UGUUACAG	1664	CTGTAACA GGCTAGCTACAACGA GAGCAGGG	4687
205	UGUUACAG G CGGGGUUU	1665	AAACCCCG GGCTAGCTACAACGA CTGTAACA	4688
210	CAGGCGGG G UUUUUCUU	1666	AAGAAAAA GGCTAGCTACAACGA CCCGCCTG	4689
248	ACCACAGA G UCUAGACU	1667	AGTCTAGA GGCTAGCTACAACGA TCTGTGGT	4690
258	CUAGACUC G UGGUGGAC	1668	GTCCACCA GGCTAGCTACAACGA GAGTCTAG	4691
261	GACUCGUG G UGGACUUC	1669	GAAGTCCA GGCTAGCTACAACGA CACGAGTC	4692
295	GAACACCC G UGUGUCUU	1670	AAGACACA GGCTAGCTACAACGA GGGTGTTC	4693
305	GUGUCUUG G CCAAAAUU	1671	AATTTTGG GGCTAGCTACAACGA CAAGACAC	4694
318	AAUUCGCA G UCCCAAAU	1672	ATTTGGGA GGCTAGCTACAACGA TGCGAATT	4695
332	AAUCUCCA G UCACUCAC	1673	GTGAGTGA GGCTAGCTACAACGA TGGAGATT	4696
368	UUGUCCUG G UUAUCGCU	1674	AGCGATAA GGCTAGCTACAACGA CAGGACAA	4697
390	UGUCUGCG G CGUUUUAU	1675	ATAAAACG GGCTAGCTACAACGA CGCAGACA	4698
392	UCUGCGGC G UUUUAUCA	1676	TGATAAAA GGCTAGCTACAACGA GCCGCAGA	4699
442	UCUUGUUG G UUCUUCUG	1677	CAGAAGAA GGCTAGCTACAACGA CAACAAGA	4700
461	CUAUCAAG G UAUGUUGC	1678	GCAACATA GGCTAGCTACAACGA CTTGATAG	4701
472	UGUUGCCC G UUUGUCCU	1679	AGGACAAA GGCTAGCTACAACGA GGGCAACA	4702
506	AACAACCA G CACCGGAC	1680	GTCCGGTG GGCTAGCTACAACGA TGGTTGTT	4703
625	CAUCUUGG G CUUUCGCA	1681	TGCGAAAG GGCTAGCTACAACGA CCAAGATG	4704

Table 41

648	CUAUGGGA G UGGGCCUC	1682	GAGGCCCA GGCTAGCTACAACGA TCCCATAG	4705
652	GGGAGUGG G CCUCAGUC	1683	GACTGAGG GGCTAGCTACAACGA CCACTCCC	4706
658	GGGCCUCA G UCCGUUUC	1684	GAAACGGA GGCTAGCTACAACGA TGAGGCCC	4707
662	CUCAGUCC G UUUCUCUU	1685	AAGAGAAA GGCTAGCTACAACGA GGACTGAG	4708
672	UUCUCUUG G CUCAGUUU	1686	AAACTGAG GGCTAGCTACAACGA CAAGAGAA	4709
677	UUGGCUCA G UUUACUAG	1687	CTAGTAAA GGCTAGCTACAACGA TGAGCCAA	4710
685	GUUUACUA G UGCCAUUU	1688	AAATGGCA GGCTAGCTACAACGA TAGTAAAC	4711
699	UUUGUUCA G UGGUUCGU	1689	ACGAACCA GGCTAGCTACAACGA TGAACAAA	4712
702	GUUCAGUG G UUCGUAGG	1690	CCTACGAA GGCTAGCTACAACGA CACTGAAC	4713
706	AGUGGUUC G UAGGGCUU	1691	AAGCCCTA GGCTAGCTACAACGA GAACCACT	4714
711	UUCGUAGG G CUUUCCCC	1692	GGGGAAAG GGCTAGCTACAACGA CCTACGAA	4715
729	ACUGUCUG G CUUUCAGU	1693	ACTGAAAG GGCTAGCTACAACGA CAGACAGT	4716
736	GGCUUUCA G UUAUAUGG	1694	CCATATAA GGCTAGCTACAACGA TGAAAGCC	4717
753	AUGAUGUG G UUUUGGGG	1695	CCCCAAAA GGCTAGCTACAACGA CACATCAT	4718
762	UUUUGGGG G CCAAGUCU	1696	AGACTTGG GGCTAGCTACAACGA CCCCAAAA	4719
767	GGGGCCAA G UCUGUACA	1697	TGTACAGA GGCTAGCTACAACGA TTGGCCCC	4720
785	CAUCUUGA G UCCCUUUA	1698	TAAAGGGA GGCTAGCTACAACGA TCAAGATG	4721
826	GUCUUUGG G UAUACAUU	1699	AATGTATA GGCTAGCTACAACGA CCAAAGAC	4722
898	AAUUGGGA G UUGGGGCA	1700	TGCCCCAA GGCTAGCTACAACGA TCCCAATT	4723
904	GAGUUGGG G CACAUUGC	1701	GCAATGTG GGCTAGCTACAACGA CCCAACTC	4724
971	GUAAACAG G CCUAUUGA	1702	TCAATAGG GGCTAGCTACAACGA CTGTTTAC	4725
987	AUUGGAAA G UAUGUCAA	1703	TTGACATA GGCTAGCTACAACGA TTTCCAAT	4726
1006	AAUUGUGG G UCUUUUGG	1704	CCAAAAGA GGCTAGCTACAACGA CCACAATT	4727
1016	CUUUUGGG G UUUGCCGC	1705	GCGGCAAA GGCTAGCTACAACGA CCCAAAAG	4728
1080	GCAUACAA G CAAAACAG	1706	CTGTTTTG GGCTAGCTACAACGA TTGTATGC	4729
1089	CAAAACAG G CUUUUACU	1707	AGTAAAAG GGCTAGCTACAACGA CTGTTTTG	4730
1116	CUUACAAG G CCUUUCUA	1708	TAGAAAGG GGCTAGCTACAACGA CTTGTAAG	4731
1126	CUUUCUAA G UAAACAGU	1709	ACTGTTTA GGCTAGCTACAACGA TTAGAAAG	4732
1133	AGUAAACA G UAUGUGAA	1710	TTCACATA GGCTAGCTACAACGA TGTTTACT	4733
1152	UUUACCCC G UUGCUCGG	1711	CCGAGCAA GGCTAGCTACAACGA GGGGTAAA	4734
1160	GUUGCUCG G CAACGGCC	1712	GGCCGTTG GGCTAGCTACAACGA CGAGCAAC	4735
1166	CGGCAACG G CCUGGUCU	1713	AGACCAGG GGCTAGCTACAACGA CGTTGCCG	4736
1171	ACGGCCUG G UCUAUGCC	1714	GGCATAGA GGCTAGCTACAACGA CAGGCCGT	4737
1182	UAUGCCAA G UGUUUGCU	1715	AGCAAACA GGCTAGCTACAACGA TTGGCATA	4738
1207	CCCCACUG G UUGGGGCU	1716	AGCCCCAA GGCTAGCTACAACGA CAGTGGGG	4739
1213	UGGUUGGG G CUUGGCCA	1717	TGGCCAAG GGCTAGCTACAACGA CCCAACCA	4740
1218	GGGGCUUG G CCAUAGGC	1718	GCCTATGG GGCTAGCTACAACGA CAAGCCCC	4741
1225	GGCCAUAG G CCAUCAGC	1719	GCTGATGG GGCTAGCTACAACGA CTATGGCC	4742
1232	GGCCAUCA G CGCAUGCG	1720	CGCATGCG GGCTAGCTACAACGA TGATGGCC	4743
1240	GCGCAUGC G UGGAACCU	1721	AGGTTCCA GGCTAGCTACAACGA GCATGCGC	4744
1287	AACUCCUA G CCGCUUGU	1722	ACAAGCGG GGCTAGCTACAACGA TAGGAGTT	4745
1306	UGCUCGCA G CAGGUCUG	1723	CAGACCTG GGCTAGCTACAACGA TGCGAGCA	4746
1310	CGCAGCAG G UCUGGGGC	1724	GCCCCAGA GGCTAGCTACAACGA CTGCTGCG	4747
1317	GGUCUGGG G CAAAACUC	1725	GAGTTTTG GGCTAGCTACAACGA CCCAGACC	4748
1347	AUUCUGUC G UGCUCUCC	1726	GGAGAGCA GGCTAGCTACAACGA GACAGAAT	4749
1379	UUUCCAUG G CUGCUAGG	1727	CCTAGCAG GGCTAGCTACAACGA CATGGAAA	4750
1387	GCUGCUAG G CUGUGCUG	1728	CAGCACAG GGCTAGCTACAACGA CTAGCAGC	4751
1418	CGCGGGAC G UCCUUUGU	1729	ACAAAGGA GGCTAGCTACAACGA GTCCCGCG	4752
1431	UUGUUUAC G UCCCGUCG	1730	CGACGGGA GGCTAGCTACAACGA GTAAACAA	4753
1436	UACGUCCC G UCGGCGCU	1731	AGCGCCGA GGCTAGCTACAACGA GGGACGTA	4754
1440	UCCCGUCG G CGCUGAAU	1732	ATTCAGCG GGCTAGCTACAACGA CGACGGGA	4755

Table 41

1471	CUCCCGGG G CCGCUUGG	1733	CCAAGCGG GGCTAGCTACAACGA CCCGGGAG	4756
1481	CGCUUGGG G CUCUACCG	1734	CGGTAGAG GGCTAGCTACAACGA CCCAAGCG	4757
1517	UACCGACC G UCCACGGG	1735	CCCGTGGA GGCTAGCTACAACGA GGTCGGTA	4758
1526	UCCACGGG G CGCACCUC	1736	GAGGTGCG GGCTAGCTACAACGA CCCGTGGA	4759
1553	GACUCCCC G UCUGUGCC	1737	GGCACAGA GGCTAGCTACAACGA GGGGAGTC	4760
1579	GCCGGACC G UGUGCACU	1738	AGTGCACA GGCTAGCTACAACGA GGTCCGGC	4761
1605	CUCUGCAC G UCGCAUGG	1739	CCATGCGA GGCTAGCTACAACGA GTGCAGAG	4762
1622	AGACCACC G UGAACGCC	1740	GGCGTTCA GGCTAGCTACAACGA GGTGGTCT	4763
1649	UGCCCAAG G UCUUGCAU	1741	ATGCAAGA GGCTAGCTACAACGA CTTGGGCA	4764
1679	GACUUUCA G CAAUGUCA	1742	TGACATTG GGCTAGCTACAACGA TGAAAGTC	4765
1703	ACCUUGAG G CAUACUUC	1743	GAAGTATG GGCTAGCTACAACGA CTCAAGGT	4766
1732	UUUAAUGA G UGGGAGGA	1744	TCCTCCCA GGCTAGCTACAACGA TCATTAAA	4767
1741	UGGGAGGA G UUGGGGGA	1745	TCCCCCAA GGCTAGCTACAACGA TCCTCCCA	4768
1754	GGGAGGAG G UUAGGUUA	1746	TAACCTAA GGCTAGCTACAACGA CTCCTCCC	4769
1759	GAGGUUAG G UUAAAGGU	1747	ACCTTTAA GGCTAGCTACAACGA CTAACCTC	4770
1766	GGUUAAAG G UCUUUGUA	1748	TACAAAGA GGCTAGCTACAACGA CTTTAACC	4771
1782	ACUAGGAG G CUGUAGGC	1749	GCCTACAG GGCTAGCTACAACGA CTCCTAGT	4772
1789	GGCUGUAG G CAUAAAUU	1750	AATTTATG GGCTAGCTACAACGA CTACAGCC	4773
1799	AUAAAUUG G UGUGUUCA	1751	TGAACACA GGCTAGCTACAACGA CAATTTAT	4774
1811	GUUCACCA G CACCAUGC	1752	GCATGGTG GGCTAGCTACAACGA TGGTGAAC	4775
1870	CUGUUCAA G CCUCCAAG	1753	CTTGGAGG GGCTAGCTACAACGA TTGAACAG	4776
1878	GCCUCCAA G CUGUGCCU	1754	AGGCACAG GGCTAGCTACAACGA TTGGAGGC	4777
1890	UGCCUUGG G UGGCUUUG	1755	CAAAGCCA GGCTAGCTACAACGA CCAAGGCA	4778
1893	CUUGGGUG G CUUUGGGG	1756	CCCCAAAG GGCTAGCTACAACGA CACCCAAG	4779
1901	GCUUUGGG G CAUGGACA	1757	TGTCCATG GGCTAGCTACAACGA CCCAAAGC	4780
1917	AUUGACCC G UAUAAAGA	1758	TCTTTATA GGCTAGCTACAACGA GGGTCAAT	4781
1933	AAUUUGGA G CUUCUGUG	1759	CACAGAAG GGCTAGCTACAACGA TCCAAATT	4782
1944	UCUGUGGA G UUACUCUC	1760	GAGAGTAA GGCTAGCTACAACGA TCCACAGA	4783
2023	AUCGGGGG G CCUUAGAG	1761	CTCTAAGG GGCTAGCTACAACGA CCCCCGAT	4784
2031	GCCUUAGA G UCUCCGGA	1762	TCCGGAGA GGCTAGCTACAACGA TCTAAGGC	4785
2062	ACCAUACG G CACUCAGG	1763	CCTGAGTG GGCTAGCTACAACGA CGTATGGT	4786
2070	GCACUCAG G CAAGCUAU	1764	ATAGCTTG GGCTAGCTACAACGA CTGAGTGC	4787
2074	UCAGGCAA G CUAUUCUG	1765	CAGAATAG GGCTAGCTACAACGA TTGCCTGA	4788
2090	GUGUUGGG G UGAGUUGA	1766	TCAACTCA GGCTAGCTACAACGA CCCAACAC	4789
2094	UGGGGUGA G UUGAUGAA	1767	TTCATCAA GGCTAGCTACAACGA TCACCCCA	4790
2107	UGAAUCUA G CCACCUGG	1768	CCAGGTGG GGCTAGCTACAACGA TAGATTCA	4791
2116	CCACCUGG G UGGGAAGU	1769	ACTTCCCA GGCTAGCTACAACGA CCAGGTGG	4792
2123	GGUGGGAA G UAAUUUGG	1770	CCAAATTA GGCTAGCTACAACGA TTCCCACC	4793
2140	AAGAUCCA G CAUCCAGG	1771	CCTGGATG GGCTAGCTACAACGA TGGATCTT	4794
2155	GGGAAUUA G UAGUCAGC	1772	GCTGACTA GGCTAGCTACAACGA TAATTCCC	4795
2158	AAUUAGUA G UCAGCUAU	1773	ATAGCTGA GGCTAGCTACAACGA TACTAATT	4796
2162	AGUAGUCA G CUAUGUCA	1774	TGACATAG GGCTAGCTACAACGA TGACTACT	4797
2173	AUGUCAAC G UUAAUAUG	1775	CATATTAA GGCTAGCTACAACGA GTTGACAT	4798
2183	UAAUAUGG G CCUAAAAA	1776	TTTTTAGG GGCTAGCTACAACGA CCATATTA	4799
2208	CUAUUGUG G UUUCACAU	1777	ATGTGAAA GGCTAGCTACAACGA CACAATAG	4800
2235	ACUUUUGG G CGAGAAAC	1778	GTTTCTCG GGCTAGCTACAACGA CCAAAAGT	4801
2260	AAUAUUUG G UGUCUUUU	1779	AAAAGACA GGCTAGCTACAACGA CAAATATT	4802
2272	CUUUUGGA G UGUGGAUU	1780	AATCCACA GGCTAGCTACAACGA TCCAAAAG	4803
2360	ACGAAGAG G CAGGUCCC	1781	GGGACCTG GGCTAGCTACAACGA CTCTTCGT	4804
2364	AGAGGCAG G UCCCCUAG	1782	CTAGGGGA GGCTAGCTACAACGA CTGCCTCT	4805
2403	AGACGAAG G UCUCAAUC	1783	GATTGAGA GGCTAGCTACAACGA CTTCGTCT	4806

Table 41

2417	AUCGCCGC G UCGCAGAA	1784	TTCTGCGA GGCTAGCTACAACGA GCGGCGAT	4807
2454	CAAUGUUA G UAUUCCUU	1785	AAGGAATA GGCTAGCTACAACGA TAACATTG	4808
2474	CACAUAAG G UGGGAAAC	1786	GTTTCCCA GGCTAGCTACAACGA CTTATGTG	4809
2491	UUUACGGG G CUUUAUUC	1787	GAATAAAG GGCTAGCTACAACGA CCCGTAAA	4810
2507	CUUCUACG G UACCUUGC	1788	GCAAGGTA GGCTAGCTACAACGA CGTAGAAG	4811
2530	CCUAAAUG G CAAACUCC	1789	GGAGTTTG GGCTAGCTACAACGA CATTTAGG	4812
2587	AGAUGUAA G CAAUUUGU	1790	ACAAATTG GGCTAGCTACAACGA TTACATCT	4813
2599	UUUGUGGG G CCCCUUAC	1791	GTAAGGGG GGCTAGCTACAACGA CCCACAAA	4814
2609	CCCUUACA G UAAAUGAA	1792	TTCATTTA GGCTAGCTACAACGA TGTAAGGG	4815
2650	CCUGCUAG G UUUUAUCC	1793	GGATAAAA GGCTAGCTACAACGA CTAGCAGG	4816
2701	AUCAAACC G UAUUAUCC	1794	GGATAATA GGCTAGCTACAACGA GGTTTGAT	4817
2713	UAUCCAGA G UAUGUAGU	1795	ACTACATA GGCTAGCTACAACGA TCTGGATA	4818
2720	AGUAUGUA G UUAAUCAU	1796	ATGATTAA GGCTAGCTACAACGA TACATACT	4819
2768	UUUGGAAG G CGGGGAUC	1797	GATCCCCG GGCTAGCTACAACGA CTTCCAAA	4820
2791	AAAAGAGA G UCCACACG	1798	CGTGTGGA GGCTAGCTACAACGA TCTCTTTT	4821
2799	GUCCACAC G UAGCGCCU	1799	AGGCGCTA GGCTAGCTACAACGA GTGTGGAC	4822
2802	CACACGUA G CGCCUCAU	1800	ATGAGGCG GGCTAGCTACAACGA TACGTGTG	4823
2818	UUUUGCGG G UCACCAUA	1801	TATGGTGA GGCTAGCTACAACGA CCGCAAAA	4824
2848	GAUCUACA G CAUGGGAG	1802	CTCCCATG GGCTAGCTACAACGA TGTAGATC	4825
2857	CAUGGGAG G UUGGUCUU	1803	AAGACCAA GGCTAGCTACAACGA CTCCCATG	4826
2861	GGAGGUUG G UCUUCCAA	1804	TTGGAAGA GGCTAGCTACAACGA CAACCTCC	4827
2881	UCGAAAAG G CAUGGGGA	1805	TCCCCATG GGCTAGCTACAACGA CTTTTCGA	4828
2936	GAUCAUCA G UUGGACCC	1806	GGGTCCAA GGCTAGCTACAACGA TGATGATC	4829
2955	CAUUCAAA G CCAACUCA	1807	TGAGTTGG GGCTAGCTACAACGA TTTGAATG	4830
2964	CCAACUCA G UAAAUCCA	1808	TGGATTTA GGCTAGCTACAACGA TGAGTTGG	4831
3005	GACAACUG G CCGGACGC	1809	GCGTCCGG GGCTAGCTACAACGA CAGTTGTC	4832
3021	CCAACAAG G UGGGAGUG	1810	CACTCCCA GGCTAGCTACAACGA CTTGTTGG	4833
3027	AGGUGGGA G UGGGAGCA	1811	TGCTCCCA GGCTAGCTACAACGA TCCCACCT	4834
3033	GAGUGGGA G CAUUCGGG	1812	CCCGAATG GGCTAGCTACAACGA TCCCACTC	4835
3041	GCAUUCGG G CCAGGGUU	1813	AACCCTGG GGCTAGCTACAACGA CCGAATGC	4836
3047	GGGCCAGG G UUCACCCC	1814	GGGGTGAA GGCTAGCTACAACGA CCTGGCCC	4837
3077	CUGUUGGG G UGGAGCCC	1815	GGGCTCCA GGCTAGCTACAACGA CCCAACAG	4838
3082	GGGGUGGA G CCCUCACG	1816	CGTGAGGG GGCTAGCTACAACGA TCCACCCC	4839
3097	CGCUCAGG G CCUACUCA	1817	TGAGTAGG GGCTAGCTACAACGA CCTGAGCG	4840
3117	CUGUGCCA G CAGCUCCU	1818	AGGAGCTG GGCTAGCTACAACGA TGGCACAG	4841
3120	UGCCAGCA G CUCCUCCU	1819	AGGAGGAG GGCTAGCTACAACGA TGCTGGCA	4842
3146	ACCAAUCG G CAGUCAGG	1820	CCTGACTG GGCTAGCTACAACGA CGATTGGT	4843
3149	AAUCGGCA G UCAGGAAG	1821	CTTCCTGA GGCTAGCTACAACGA TGCCGATT	4844
3158	UCAGGAAG G CAGCCUAC	1822	GTAGGCTG GGCTAGCTACAACGA CTTCCTGA	4845
3161	GGAAGGCA G CCUACUCC	1823	GGAGTAGG GGCTAGCTACAACGA TGCCTTCC	4846
3204	AUCCUCAG G CCAUGCAG	1824	CTGCATGG GGCTAGCTACAACGA CTGAGGAT	4847
10	ACUCCACC A CUUUCCAC	1825	GTGGAAAG GGCTAGCTACAACGA GGTGGAGT	4848
17	CACUUUCC A CCAAACUC	1826	GAGTTTGG GGCTAGCTACAACGA GGAAAGTG	4849
22	UCCACCAA A CUCUUCAA	1827	TTGAAGAG GGCTAGCTACAACGA TTGGTGGA	4850
32	UCUUCAAG A UCCCAGAG	1828	CTCTGGGA GGCTAGCTACAACGA CTTGAAGA	4851
53	GGCCCUGU A CUUUCCUG	1829	CAGGAAAG GGCTAGCTACAACGA ACAGGGCC	4852
82	GUUCAGGA A CAGUGAGC	1830	GCTCACTG GGCTAGCTACAACGA TCCTGAAC	4853
101	UGCUCAGA A UACUGUCU	1831	AGACAGTA GGCTAGCTACAACGA TCTGAGCA	4854
103	CUCAGAAU A CUGUCUCU	1832	AGAGACAG GGCTAGCTACAACGA ATTCTGAG	4855
115	UCUCUGCC A UAUCGUCA	1833	TGACGATA GGCTAGCTACAACGA GGCAGAGA	4856
117	UCUGCCAU A UCGUCAAU	1834	ATTGACGA GGCTAGCTACAACGA ATGGCAGA	4857

Table 41

124	UAUCGUCA A UCUUAUCG	1835	CGATAAGA GGCTAGCTACAACGA TGACGATA	4858
129	UCAAUCUU A UCGAAGAC	1836	GTCTTCGA GGCTAGCTACAACGA AAGATTGA	4859
136	UAUCGAAG A CUGGGGAC	1837	GTCCCCAG GGCTAGCTACAACGA CTTCGATA	4860
143	GACUGGGG A CCCUGUAC	1838	GTACAGGG GGCTAGCTACAACGA CCCCAGTC	4861
150	GACCCUGU A CCGAACAU	1839	ATGTTCGG GGCTAGCTACAACGA ACAGGGTC	4862
155	UGUACCGA A CAUGGAGA	1840	TCTCCATG GGCTAGCTACAACGA TCGGTACA	4863
157	UACCGAAC A UGGAGAAC	1841	GTTCTCCA GGCTAGCTACAACGA GTTCGGTA	4864
164	CAUGGAGA A CAUCGCAU	1842	ATGCGATG GGCTAGCTACAACGA TCTCCATG	4865
166	UGGAGAAC A UCGCAUCA	1843	TGATGCGA GGCTAGCTACAACGA GTTCTCCA	4866
171	AACAUCGC A UCAGGACU	1844	AGTCCTGA GGCTAGCTACAACGA GCGATGTT	4867
177	GCAUCAGG A CUCCUAGG	1845	CCTAGGAG GGCTAGCTACAACGA CCTGATGC	4868
186	CUCCUAGG A CCCCUGCU	1846	AGCAGGGG GGCTAGCTACAACGA CCTAGGAG	4869
201	CUCGUGUU A CAGGCGGG	1847	CCCGCCTG GGCTAGCTACAACGA AACACGAG	4870
223	UCUUGUUG A CAAAAAUC	1848	GATTTTTG GGCTAGCTACAACGA CAACAAGA	4871
229	UGACAAAA A UCCUCACA	1849	TGTGAGGA GGCTAGCTACAACGA TTTTGTCA	4872
235	AAAUCCUC A CAAUACCA	1850	TGGTATTG GGCTAGCTACAACGA GAGGATTT	4873
238	UCCUCACA A UACCACAG	1851	CTGTGGTA GGCTAGCTACAACGA TGTGAGGA	4874
240	CUCACAAU A CCACAGAG	1852	CTCTGTGG GGCTAGCTACAACGA ATTGTGAG	4875
243	ACAAUACC A CAGAGUCU	1853	AGACTCTG GGCTAGCTACAACGA GGTATTGT	4876
254	GAGUCUAG A CUCGUGGU	1854	ACCACGAG GGCTAGCTACAACGA CTAGACTC	4877
265	CGUGGUGG A CUUCUCUC	1855	GAGAGAAG GGCTAGCTACAACGA CCACCACG	4878
275	UUCUCUCA A UUUUCUAG	1856	CTAGAAAA GGCTAGCTACAACGA TGAGAGAA	4879
289	UAGGGGGA A CACCCGUG	1857	CACGGGTG GGCTAGCTACAACGA TCCCCCTA	4880
291	GGGGGAAC A CCCGUGUG	1858	CACACGGG GGCTAGCTACAACGA GTTCCCCC	4881
311	UGGCCAAA A UUCGCAGU	1859	ACTGCGAA GGCTAGCTACAACGA TTTGGCCA	4882
325	AGUCCCAA A UCUCCAGU	1860	ACTGGAGA GGCTAGCTACAACGA TTGGGACT	4883
335	CUCCAGUC A CUCACCAA	1861	TTGGTGAG GGCTAGCTACAACGA GACTGGAG	4884
339	AGUCACUC A CCAACCUG	1862	CAGGTTGG GGCTAGCTACAACGA GAGTGACT	4885
343	ACUCACCA A CCUGUUGU	1863	ACAACAGG GGCTAGCTACAACGA TGGTGAGT	4886
358	GUCCUCCA A UUUGUCCU	1864	AGGACAAA GGCTAGCTACAACGA TGGAGGAC	4887
371	UCCUGGUU A UCGCUGGA	1865	TCCAGCGA GGCTAGCTACAACGA AACCAGGA	4888
379	AUCGCUGG A UGUGUCUG	1866	CAGACACA GGCTAGCTACAACGA CCAGCGAT	4889
397	GGCGUUUU A UCAUCUUC	1867	GAAGATGA GGCTAGCTACAACGA AAAACGCC	4890
400	GUUUUAUC A UCUUCCUC	1868	GAGGAAGA GGCTAGCTACAACGA GATAAAAC	4891
412	UCCUCUGC A UCCUGCUG	1869	CAGCAGGA GGCTAGCTACAACGA GCAGAGGA	4892
423	CUGCUGCU A UGCCUCAU	1870	ATGAGGCA GGCTAGCTACAACGA AGCAGCAG	4893
430	UAUGCCUC A UCUUCUUG	1871	CAAGAAGA GGCTAGCTACAACGA GAGGCATA	4894
452	UCUUCUGG A CUAUCAAG	1872	CTTGATAG GGCTAGCTACAACGA CCAGAAGA	4895
455	UCUGGACU A UCAAGGUA	1873	TACCTTGA GGCTAGCTACAACGA AGTCCAGA	4896
463	AUCAAGGU A UGUUGCCC	1874	GGGCAACA GGCTAGCTACAACGA ACCTTGAT	4897
484	GUCCUCUA A UUCCAGGA	1875	TCCTGGAA GGCTAGCTACAACGA TAGAGGAC	4898
492	AUUCCAGG A UCAUCAAC	1876	GTTGATGA GGCTAGCTACAACGA CCTGGAAT	4899
495	CCAGGAUC A UCAACAAC	1877	GTTGTTGA GGCTAGCTACAACGA GATCCTGG	4900
499	GAUCAUCA A CAACCAGC	1878	GCTGGTTG GGCTAGCTACAACGA TGATGATC	4901
502	CAUCAACA A CCAGCACC	1879	GGTGCTGG GGCTAGCTACAACGA TGTTGATG	4902
513	AGCACCGG A CCAUGCAA	1880	TTGCATGG GGCTAGCTACAACGA CCGGTGCT	4903
516	ACCGGACC A UGCAAAAC	1881	GTTTTGCA GGCTAGCTACAACGA GGTCCGGT	4904
523	CAUGCAAA A CCUGCACA	1882	TGTGCAGG GGCTAGCTACAACGA TTTGCATG	4905
529	AAACCUGC A CAACUCCU	1883	AGGAGTTG GGCTAGCTACAACGA GCAGGTTT	4906
532	CCUGCACA A CUCCUGCU	1884	AGCAGGAG GGCTAGCTACAACGA TGTGCAGG	4907
547	CUCAAGGA A CCUCUAUG	1885	CATAGAGG GGCTAGCTACAACGA TCCTTGAG	4908

Table 41

553	GAACCUCU A UGUUUCCC	1886	GGGAAACA GGCTAGCTACAACGA AGAGGTTC	4909
564	UUUCCCUC A UGUUGCUG	1887	CAGCAACA GGCTAGCTACAACGA GAGGGAAA	4910
574	GUUGCUGU A CAAAACCU	1888	AGGTTTTG GGCTAGCTACAACGA ACAGCAAC	4911
579	UGUACAAA A CCUACGGA	1889	TCCGTAGG GGCTAGCTACAACGA TTTGTACA	4912
583	CAAAACCU A CGGACGGA	1890	TCCGTCCG GGCTAGCTACAACGA AGGTTTTG	4913
587	ACCUACGG A CGGAAACU	1891	AGTTTCCG GGCTAGCTACAACGA CCGTAGGT	4914
593	GGACGGAA A CUGCACCU	1892	AGGTGCAG GGCTAGCTACAACGA TTCCGTCC	4915
598	GAAACUGC A CCUGUAUU	1893	AATACAGG GGCTAGCTACAACGA GCAGTTTC	4916
604	GCACCUGU A UUCCCAUC	1894	GATGGGAA GGCTAGCTACAACGA ACAGGTGC	4917
610	GUAUUCCC A UCCCAUCA	1895	TGATGGGA GGCTAGCTACAACGA GGGAATAC	4918
615	CCCAUCCC A UCAUCUUG	1896	CAAGATGA GGCTAGCTACAACGA GGGATGGG	4919
618	AUCCCAUC A UCUUGGGC	1897	GCCCAAGA GGCTAGCTACAACGA GATGGGAT	4920
636	UUCGCAAA A UACCUAUG	1898	CATAGGTA GGCTAGCTACAACGA TTTGCGAA	4921
638	CGCAAAAU A CCUAUGGG	1899	CCCATAGG GGCTAGCTACAACGA ATTTTGCG	4922
642	AAAUACCU A UGGGAGUG	1900	CACTCCCA GGCTAGCTACAACGA AGGTATTT	4923
681	CUCAGUUU A CUAGUGCC	1901	GGCACTAG GGCTAGCTACAACGA AAACTGAG	4924
690	CUAGUGCC A UUUGUUCA	1902	TGAACAAA GGCTAGCTACAACGA GGCACTAG	4925
721	UUUCCCCC A CUGUCUGG	1903	CCAGACAG GGCTAGCTACAACGA GGGGGAAA	4926
739	UUUCAGUU A UAUGGAUG	1904	CATCCATA GGCTAGCTACAACGA AACTGAAA	4927
741	UCAGUUAU A UGGAUGAU	1905	ATCATCCA GGCTAGCTACAACGA ATAACTGA	4928
745	UUAUAUGG A UGAUGUGG	1906	CCACATCA GGCTAGCTACAACGA CCATATAA	4929
748	UAUGGAUG A UGUGGUUU	1907	AAACCACA GGCTAGCTACAACGA CATCCATA	4930
773	AAGUCUGU A CAACAUCU	1908	AGATGTTG GGCTAGCTACAACGA ACAGACTT	4931
776	UCUGUACA A CAUCUUGA	1909	TCAAGATG GGCTAGCTACAACGA TGTACAGA	4932
778	UGUACAAC A UCUUGAGU	1910	ACTCAAGA GGCTAGCTACAACGA GTTGTACA	4933
793	GUCCCUUU A UGCCGCUG	1911	CAGCGGCA GGCTAGCTACAACGA AAAGGGAC	4934
804	CCGCUGUU A CCAAUUUU	1912	AAAATTGG GGCTAGCTACAACGA AACAGCGG	4935
808	UGUUACCA A UUUUCUUU	1913	AAAGAAAA GGCTAGCTACAACGA TGGTAACA	4936
828	CUUUGGGU A UACAUUUA	1914	TAAATGTA GGCTAGCTACAACGA ACCCAAAG	4937
830	UUGGGUAU A CAUUUAAA	1915	TTTAAATG GGCTAGCTACAACGA ATACCCAA	4938
832	GGGUAUAC A UUUAAACC	1916	GGTTTAAA GGCTAGCTACAACGA GTATACCC	4939
838	ACAUUUAA A CCCUCACA	1917	TGTGAGGG GGCTAGCTACAACGA TTAAATGT	4940
844	AAACCCUC A CAAAACAA	1918	TTGTTTTG GGCTAGCTACAACGA GAGGGTTT	4941
849	CUCACAAA A CAAAAAGA	1919	TCTTTTTG GGCTAGCTACAACGA TTTGTGAG	4942
857	ACAAAAAG A UGGGGAUA	1920	TATCCCCA GGCTAGCTACAACGA CTTTTTGT	4943
863	AGAUGGGG A UAUUCCCU	1921	AGGGAATA GGCTAGCTACAACGA CCCCATCT	4944
865	AUGGGGAU A UUCCCUUA	1922	TAAGGGAA GGCTAGCTACAACGA ATCCCCAT	4945
874	UUCCCUUA A CUUCAUGG	1923	CCATGAAG GGCTAGCTACAACGA TAAGGGAA	4946
879	UUAACUUC A UGGGAUAU	1924	ATATCCCA GGCTAGCTACAACGA GAAGTTAA	4947
884	UUCAUGGG A UAUGUAAU	1925	ATTACATA GGCTAGCTACAACGA CCCATGAA	4948
886	CAUGGGAU A UGUAAUUG	1926	CAATTACA GGCTAGCTACAACGA ATCCCATG	4949
891	GAUAUGUA A UUGGGAGU	1927	ACTCCCAA GGCTAGCTACAACGA TACATATC	4950
906	GUUGGGGC A CAUUGCCA	1928	TGGCAATG GGCTAGCTACAACGA GCCCCAAC	4951
908	UGGGGCAC A UUGCCACA	1929	TGTGGCAA GGCTAGCTACAACGA GTGCCCCA	4952
914	ACAUUGCC A CAGGAACA	1930	TGTTCCTG GGCTAGCTACAACGA GGCAATGT	4953
920	CCACAGGA A CAUAUUGU	1931	ACAATATG GGCTAGCTACAACGA TCCTGTGG	4954
922	ACAGGAAC A UAUUGUAC	1932	GTACAATA GGCTAGCTACAACGA GTTCCTGT	4955
924	AGGAACAU A UUGUACAA	1933	TTGTACAA GGCTAGCTACAACGA ATGTTCCT	4956
929	CAUAUUGU A CAAAAAAU	1934	ATTTTTTG GGCTAGCTACAACGA ACAATATG	4957
936	UACAAAAA A UCAAAAUG	1935	CATTTTGA GGCTAGCTACAACGA TTTTTGTA	4958
942	AAAUCAAA A UGUGUUUU	1936	AAAACACA GGCTAGCTACAACGA TTTGATTT	4959

Table 41

956	UUUAGGAA A CUUCCUGU	1937	ACAGGAAG GGCTAGCTACAACGA TTCCTAAA	4960
967	UCCUGUAA A CAGGCCUA	1938	TAGGCCTG GGCTAGCTACAACGA TTACAGGA	4961
975	ACAGGCCU A UUGAUUGG	1939	CCAATCAA GGCTAGCTACAACGA AGGCCTGT	4962
979	GCCUAUUG A UUGGAAAG	1940	CTTTCCAA GGCTAGCTACAACGA CAATAGGC	4963
989	UGGAAAGU A UGUCAACG	1941	CGTTGACA GGCTAGCTACAACGA ACTTTCCA	4964
995	GUAUGUCA A CGAAUUGU	1942	ACAATTCG GGCTAGCTACAACGA TGACATAC	4965
999	GUCAACGA A UUGUGGGU	1943	ACCCACAA GGCTAGCTACAACGA TCGTTGAC	4966
1032	CCCCUUUC A CGCAAUGU	1944	ACATTGCG GGCTAGCTACAACGA GAAAGGGG	4967
1037	UUCACGCA A UGUGGAUA	1945	TATCCACA GGCTAGCTACAACGA TGCGTGAA	4968
1043	CAAUGUGG A UAUUCUGC	1946	GCAGAATA GGCTAGCTACAACGA CCACATTG	4969
1045	AUGUGGAU A UUCUGCUU	1947	AAGCAGAA GGCTAGCTACAACGA ATCCACAT	4970
1056	CUGCUUUA A UGCCUUUA	1948	TAAAGGCA GGCTAGCTACAACGA TAAAGCAG	4971
1064	AUGCCUUU A UAUGCAUG	1949	CATGCATA GGCTAGCTACAACGA AAAGGCAT	4972
1066	GCCUUUAU A UGCAUGCA	1950	TGCATGCA GGCTAGCTACAACGA ATAAAGGC	4973
1070	UUAUAUGC A UGCAUACA	1951	TGTATGCA GGCTAGCTACAACGA GCATATAA	4974
1074	AUGCAUGC A UACAAGCA	1952	TGCTTGTA GGCTAGCTACAACGA GCATGCAT	4975
1076	GCAUGCAU A CAAGCAAA	1953	TTTGCTTG GGCTAGCTACAACGA ATGCATGC	4976
1085	CAAGCAAA A CAGGCUUU	1954	AAAGCCTG GGCTAGCTACAACGA TTTGCTTG	4977
1095	AGGCUUUU A CUUUCUCG	1955	CGAGAAAG GGCTAGCTACAACGA AAAAGCCT	4978
1107	UCUCGCCA A CUUACAAG	1956	CTTGTAAG GGCTAGCTACAACGA TGGCGAGA	4979
1111	GCCAACUU A CAAGGCCU	1957	AGGCCTTG GGCTAGCTACAACGA AAGTTGGC	4980
1130	CUAAGUAA A CAGUAUGU	1958	ACATACTG GGCTAGCTACAACGA TTACTTAG	4981
1135	UAAACAGU A UGUGAACC	1959	GGTTCACA GGCTAGCTACAACGA ACTGTTTA	4982
1141	GUAUGUGA A CCUUUACC	1960	GGTAAAGG GGCTAGCTACAACGA TCACATAC	4983
1147	GAACCUUU A CCCCGUUG	1961	CAACGGGG GGCTAGCTACAACGA AAAGGTTC	4984
1163	GCUCGGCA A CGGCCUGG	1962	CCAGGCCG GGCTAGCTACAACGA TGCCGAGC	4985
1175	CCUGGUCU A UGCCAAGU	1963	ACTTGGCA GGCTAGCTACAACGA AGACCAGG	4986
1192	GUUUGCUG A CGCAACCC	1964	GGGTTGCG GGCTAGCTACAACGA CAGCAAAC	4987
1197	CUGACGCA A CCCCCACU	1965	AGTGGGGG GGCTAGCTACAACGA TGCGTCAG	4988
1203	CAACCCCC A CUGGUUGG	1966	CCAACCAG GGCTAGCTACAACGA GGGGGTTG	4989
1221	GCUUGGCC A UAGGCCAU	1967	ATGGCCTA GGCTAGCTACAACGA GGCCAAGC	4990
1228	CAUAGGCC A UCAGCGCA	1968	TGCGCTGA GGCTAGCTACAACGA GGCCTATG	4991
1236	AUCAGCGC A UGCGUGGA	1969	TCCACGCA GGCTAGCTACAACGA GCGCTGAT	4992
1245	UGCGUGGA A CCUUUGUG	1970	CACAAAGG GGCTAGCTACAACGA TCCACGCA	4993
1266	CUCUGCCG A UCCAUACC	1971	GGTATGGA GGCTAGCTACAACGA CGGCAGAG	4994
1270	GCCGAUCC A UACCGCGG	1972	CCGCGGTA GGCTAGCTACAACGA GGATCGGC	4995
1272	CGAUCCAU A CCGCGGAA	1973	TTCCGCGG GGCTAGCTACAACGA ATGGATCG	4996
1280	ACCGCGGA A CUCCUAGC	1974	GCTAGGAG GGCTAGCTACAACGA TCCGCGGT	4997
1322	GGGGCAAA A CUCAUCGG	1975	CCGATGAG GGCTAGCTACAACGA TTTGCCCC	4998
1326	CAAAACUC A UCGGGACU	1976	AGTCCCGA GGCTAGCTACAACGA GAGTTTTG	4999
1332	UCAUCGGG A CUGACAAU	1977	ATTGTCAG GGCTAGCTACAACGA CCCGATGA	5000
1336	CGGGACUG A CAAUUCUG	1978	CAGAATTG GGCTAGCTACAACGA CAGTCCCG	5001
1339	GACUGACA A UUCUGUCG	1979	CGACAGAA GGCTAGCTACAACGA TGTCAGTC	5002
1361	UCCCGCAA A UAUACAUC	1980	GATGTATA GGCTAGCTACAACGA TTGCGGGA	5003
1363	CCGCAAAU A UACAUCAU	1981	ATGATGTA GGCTAGCTACAACGA ATTTGCGG	5004
1365	GCAAAUAU A CAUCAUUU	1982	AAATGATG GGCTAGCTACAACGA ATATTTGC	5005
1367	AAAUAUAC A UCAUUUCC	1983	GGAAATGA GGCTAGCTACAACGA GTATATTT	5006
1370	UAUACAUC A UUUCCAUG	1984	CATGGAAA GGCTAGCTACAACGA GATGTATA	5007
1376	UCAUUUCC A UGGCUGCU	1985	AGCAGCCA GGCTAGCTACAACGA GGAAATGA	5008
1399	UGCUGCCA A CUGGAUCC	1986	GGATCCAG GGCTAGCTACAACGA TGGCAGCA	5009
1404	CCAACUGG A UCCUACGC	1987	GCGTAGGA GGCTAGCTACAACGA CCAGTTGG	5010

Table 41

1409	UGGAUCCU A CGCGGGAC	1988	GTCCCGCG GGCTAGCTACAACGA AGGATCCA	5011
1416	UACGCGGG A CGUCCUUU	1989	AAAGGACG GGCTAGCTACAACGA CCCGCGTA	5012
1429	CUUUGUUU A CGUCCCGU	1990	ACGGGACG GGCTAGCTACAACGA AAACAAAG	5013
1447	GGCGCUGA A UCCCGCGG	1991	CCGCGGGA GGCTAGCTACAACGA TCAGCGCC	5014
1456	UCCCGCGG A CGACCCCU	1992	AGGGGTCG GGCTAGCTACAACGA CCGCGGGA	5015
1459	CGCGGACG A CCCCUCCC	1993	GGGAGGGG GGCTAGCTACAACGA CGTCCGCG	5016
1486	GGGGCUCU A CCGCCCGC	1994	GCGGGCGG GGCTAGCTACAACGA AGAGCCCC	5017
1505	CUCCGCCU A UUGUACCG	1995	CGGTACAA GGCTAGCTACAACGA AGGCGGAG	5018
1510	CCUAUUGU A CCGACCGU	1996	ACGGTCGG GGCTAGCTACAACGA ACAATAGG	5019
1514	UUGUACCG A CCGUCCAC	1997	GTGGACGG GGCTAGCTACAACGA CGGTACAA	5020
1521	GACCGUCC A CGGGGCGC	1998	GCGCCCCG GGCTAGCTACAACGA GGACGGTC	5021
1530	CGGGGCGC A CCUCUCUU	1999	AAGAGAGG GGCTAGCTACAACGA GCGCCCCG	5022
1540	CUCUCUUU A CGCGGACU	2000	AGTCCGCG GGCTAGCTACAACGA AAAGAGAG	5023
1546	UUACGCGG A CUCCCCGU	2001	ACGGGGAG GGCTAGCTACAACGA CCGCGTAA	5024
1567	GCCUUCUC A UCUGCCGG	2002	CCGGCAGA GGCTAGCTACAACGA GAGAAGGC	5025
1576	UCUGCCGG A CCGUGUGC	2003	GCACACGG GGCTAGCTACAACGA CCGGCAGA	5026
1585	CCGUGUGC A CUUCGCUU	2004	AAGCGAAG GGCTAGCTACAACGA GCACACGG	5027
1595	UUCGCUUC A CCUCUGCA	2005	TGCAGAGG GGCTAGCTACAACGA GAAGCGAA	5028
1603	ACCUCUGC A CGUCGCAU	2006	ATGCGACG GGCTAGCTACAACGA GCAGAGGT	5029
1610	CACGUCGC A UGGAGACC	2007	GGTCTCCA GGCTAGCTACAACGA GCGACGTG	5030
1616	GCAUGGAG A CCACCGUG	2008	CACGGTGG GGCTAGCTACAACGA CTCCATGC	5031
1619	UGGAGACC A CCGUGAAC	2009	GTTCACGG GGCTAGCTACAACGA GGTCTCCA	5032
1626	CACCGUGA A CGCCCACA	2010	TGTGGGCG GGCTAGCTACAACGA TCACGGTG	5033
1638	CCACAGGA A CCUGCCCA	2011	TGGGCAGG GGCTAGCTACAACGA TCCTGTGG	5034
1656	GGUCUUGC A UAAGAGGA	2012	TCCTCTTA GGCTAGCTACAACGA GCAAGACC	5035
1664	AUAAGAGG A CUCUUGGA	2013	TCCAAGAG GGCTAGCTACAACGA CCTCTTAT	5036
1672	ACUCUUGG A CUUUCAGC	2014	GCTGAAAG GGCTAGCTACAACGA CCAAGAGT	5037
1682	UUUCAGCA A UGUCAACG	2015	CGTTGACA GGCTAGCTACAACGA TGCTGAAA	5038
1688	CAAUGUCA A CGACCGAC	2016	GTCGGTCG GGCTAGCTACAACGA TGACATTG	5039
1691	UGUCAACG A CCGACCUU	2017	AAGGTCGG GGCTAGCTACAACGA CGTTGACA	5040
1695	AACGACCG A CCUUGAGG	2018	CCTCAAGG GGCTAGCTACAACGA CGGTCGTT	5041
1705	CUUGAGGC A UACUUCAA	2019	TTGAAGTA GGCTAGCTACAACGA GCCTCAAG	5042
1707	UGAGGCAU A CUUCAAAG	2020	CTTTGAAG GGCTAGCTACAACGA ATGCCTCA	5043
1716	CUUCAAAG A CUGUGUGU	2021	ACACACAG GGCTAGCTACAACGA CTTTGAAG	5044
1728	UGUGUUUA A UGAGUGGG	2022	CCCACTCA GGCTAGCTACAACGA TAAACACA	5045
1774	GUCUUUGU A CUAGGAGG	2023	CCTCCTAG GGCTAGCTACAACGA ACAAAGAC	5046
1791	CUGUAGGC A UAAAUUGG	2024	CCAATTTA GGCTAGCTACAACGA GCCTACAG	5047
1795	AGGCAUAA A UUGGUGUG	2025	CACACCAA GGCTAGCTACAACGA TTATGCCT	5048
1807	GUGUGUUC A CCAGCACC	2026	GGTGCTGG GGCTAGCTACAACGA GAACACAC	5049
1813	UCACCAGC A CCAUGCAA	2027	TTGCATGG GGCTAGCTACAACGA GCTGGTGA	5050
1816	CCAGCACC A UGCAACUU	2028	AAGTTGCA GGCTAGCTACAACGA GGTGCTGG	5051
1821	ACCAUGCA A CUUUUUCA	2029	TGAAAAAG GGCTAGCTACAACGA TGCATGGT	5052
1829	ACUUUUUC A CCUCUGCC	2030	GGCAGAGG GGCTAGCTACAACGA GAAAAAGT	5053
1840	UCUGCCUA A UCAUCUCA	2031	TGAGATGA GGCTAGCTACAACGA TAGGCAGA	5054
1843	GCCUAAUC A UCUCAUGU	2032	ACATGAGA GGCTAGCTACAACGA GATTAGGC	5055
1848	AUCAUCUC A UGUUCAUG	2033	CATGAACA GGCTAGCTACAACGA GAGATGAT	5056
1854	UCAUGUUC A UGUCCUAC	2034	GTAGGACA GGCTAGCTACAACGA GAACATGA	5057
1861	CAUGUCCU A CUGUUCAA	2035	TTGAACAG GGCTAGCTACAACGA AGGACATG	5058
1903	UUUGGGGC A UGGACAUU	2036	AATGTCCA GGCTAGCTACAACGA GCCCCAAA	5059
1907	GGGCAUGG A CAUUGACC	2037	GGTCAATG GGCTAGCTACAACGA CCATGCCC	5060
1909	GCAUGGAC A UUGACCCG	2038	CGGGTCAA GGCTAGCTACAACGA GTCCATGC	5061

Table 41

1913	GGACAUUG A CCCGUAUA	2039	TATACGGG GGCTAGCTACAACGA CAATGTCC	5062
1919	UGACCCGU A UAAAGAAU	2040	ATTCTTTA GGCTAGCTACAACGA ACGGGTCA	5063
1926	UAUAAAGA A UUUGGAGC	2041	GCTCCAAA GGCTAGCTACAACGA TCTTTATA	5064
1947	GUGGAGUU A CUCUCUUU	2042	AAAGAGAG GGCTAGCTACAACGA AACTCCAC	5065
1967	GCCUUCUG A CUUCUUUC	2043	GAAAGAAG GGCTAGCTACAACGA CAGAAGGC	5066
1981	UUCCUUCU A UUCGAGAU	2044	ATCTCGAA GGCTAGCTACAACGA AGAAGGAA	5067
1988	UAUUCGAG A UCUCCUCG	2045	CGAGGAGA GGCTAGCTACAACGA CTCGAATA	5068
1997	UCUCCUCG A CACCGCCU	2046	AGGCGGTG GGCTAGCTACAACGA CGAGGAGA	5069
1999	UCCUCGAC A CCGCCUCU	2047	AGAGGCGG GGCTAGCTACAACGA GTCGAGGA	5070
2015	UGCUCUGU A UCGGGGGG	2048	CCCCCCGA GGCTAGCTACAACGA ACAGAGCA	5071
2040	UCUCCGGA A CAUUGUUC	2049	GAACAATG GGCTAGCTACAACGA TCCGGAGA	5072
2042	UCCGGAAC A UUGUUCAC	2050	GTGAACAA GGCTAGCTACAACGA GTTCCGGA	5073
2049	CAUUGUUC A CCUCACCA	2051	TGGTGAGG GGCTAGCTACAACGA GAACAATG	5074
2054	UUCACCUC A CCAUACGG	2052	CCGTATGG GGCTAGCTACAACGA GAGGTGAA	5075
2057	ACCUCACC A UACGGCAC	2053	GTGCCGTA GGCTAGCTACAACGA GGTGAGGT	5076
2059	CUCACCAU A CGGCACUC	2054	GAGTGCCG GGCTAGCTACAACGA ATGGTGAG	5077
2064	CAUACGGC A CUCAGGCA	2055	TGCCTGAG GGCTAGCTACAACGA GCCGTATG	5078
2077	GGCAAGCU A UUCUGUGU	2056	ACACAGAA GGCTAGCTACAACGA AGCTTGCC	5079
2098	GUGAGUUG A UGAAUCUA	2057	TAGATTCA GGCTAGCTACAACGA CAACTCAC	5080
2102	GUUGAUGA A UCUAGCCA	2058	TGGCTAGA GGCTAGCTACAACGA TCATCAAC	5081
2110	AUCUAGCC A CCUGGGUG	2059	CACCCAGG GGCTAGCTACAACGA GGCTAGAT	5082
2126	GGGAAGUA A UUUGGAAG	2060	CTTCCAAA GGCTAGCTACAACGA TACTTCCC	5083
2135	UUUGGAAG A UCCAGCAU	2061	ATGCTGGA GGCTAGCTACAACGA CTTCCAAA	5084
2142	GAUCCAGC A UCCAGGGA	2062	TCCCTGGA GGCTAGCTACAACGA GCTGGATC	5085
2151	UCCAGGGA A UUAGUAGU	2063	ACTACTAA GGCTAGCTACAACGA TCCCTGGA	5086
2165	AGUCAGCU A UGUCAACG	2064	CGTTGACA GGCTAGCTACAACGA AGCTGACT	5087
2171	CUAUGUCA A CGUUAAUA	2065	TATTAACG GGCTAGCTACAACGA TGACATAG	5088
2177	CAACGUUA A UAUGGGCC	2066	GGCCCATA GGCTAGCTACAACGA TAACGTTG	5089
2179	ACGUUAAU A UGGGCCUA	2067	TAGGCCCA GGCTAGCTACAACGA ATTAACGT	5090
2191	GCCUAAAA A UCAGACAA	2068	TTGTCTGA GGCTAGCTACAACGA TTTTAGGC	5091
2196	AAAAUCAG A CAACUAUU	2069	AATAGTTG GGCTAGCTACAACGA CTGATTTT	5092
2199	AUCAGACA A CUAUUGUG	2070	CACAATAG GGCTAGCTACAACGA TGTCTGAT	5093
2202	AGACAACU A UUGUGGUU	2071	AACCACAA GGCTAGCTACAACGA AGTTGTCT	5094
2213	GUGGUUUC A CAUUUCCU	2072	AGGAAATG GGCTAGCTACAACGA GAAACCAC	5095
2215	GGUUUCAC A UUUCCUGU	2073	ACAGGAAA GGCTAGCTACAACGA GTGAAACC	5096
2227	CCUGUCUU A CUUUUGGG	2074	CCCAAAAG GGCTAGCTACAACGA AAGACAGG	5097
2242	GGCGAGAA A CUGUUCUU	2075	AAGAACAG GGCTAGCTACAACGA TTCTCGCC	5098
2253	GUUCUUGA A UAUUUGGU	2076	ACCAAATA GGCTAGCTACAACGA TCAAGAAC	5099
2255	UCUUGAAU A UUUGGUGU	2077	ACACCAAA GGCTAGCTACAACGA ATTCAAGA	5100
2278	GAGUGUGG A UUCGCACU	2078	AGTGCGAA GGCTAGCTACAACGA CCACACTC	5101
2284	GGAUUCGC A CUCCUCCU	2079	AGGAGGAG GGCTAGCTACAACGA GCGAATCC	5102
2295	CCUCCUGC A UAUAGACC	2080	GGTCTATA GGCTAGCTACAACGA GCAGGAGG	5103
2297	UCCUGCAU A UAGACCAC	2081	GTGGTCTA GGCTAGCTACAACGA ATGCAGGA	5104
2301	GCAUAUAG A CCACCAAA	2082	TTTGGTGG GGCTAGCTACAACGA CTATATGC	5105
2304	UAUAGACC A CCAAAUGC	2083	GCATTTGG GGCTAGCTACAACGA GGTCTATA	5106
2309	ACCACCAA A UGCCCCUA	2084	TAGGGGCA GGCTAGCTACAACGA TTGGTGGT	5107
2317	AUGCCCCU A UCUUAUCA	2085	TGATAAGA GGCTAGCTACAACGA AGGGGCAT	5108
2322	CCUAUCUU A UCAACACU	2086	AGTGTTGA GGCTAGCTACAACGA AAGATAGG	5109
2326	UCUUAUCA A CACUUCCG	2087	CGGAAGTG GGCTAGCTACAACGA TGATAAGA	5110
2328	UUAUCAAC A CUUCCGGA	2088	TCCGGAAG GGCTAGCTACAACGA GTTGATAA	5111
2338	UUCCGGAA A CUACUGUU	2089	AACAGTAG GGCTAGCTACAACGA TTCCGGAA	5112

Table 41

2341	CGGAAACU A CUGUUGUU	2090	AACAACAG GGCTAGCTACAACGA AGTTTCCG	5113
2352	GUUGUUAG A CGAAGAGG	2091	CCTCTTCG GGCTAGCTACAACGA CTAACAAC	5114
2380	GAAGAAGA A CUCCCUCG	2092	CGAGGGAG GGCTAGCTACAACGA TCTTCTTC	5115
2397	CCUCGCAG A CGAAGGUC	2093	GACCTTCG GGCTAGCTACAACGA CTGCGAGG	5116
2409	AGGUCUCA A UCGCCGCG	2094	CGCGGCGA GGCTAGCTACAACGA TGAGACCT	5117
2427	CGCAGAAG A UCUCAAUC	2095	GATTGAGA GGCTAGCTACAACGA CTTCTGCG	5118
2433	AGAUCUCA A UCUCGGGA	2096	TCCCGAGA GGCTAGCTACAACGA TGAGATCT	5119
2442	UCUCGGGA A UCUCAAUG	2097	CATTGAGA GGCTAGCTACAACGA TCCCGAGA	5120
2448	GAAUCUCA A UGUUAGUA	2098	TACTAACA GGCTAGCTACAACGA TGAGATTC	5121
2456	AUGUUAGU A UUCCUUGG	2099	CCAAGGAA GGCTAGCTACAACGA ACTAACAT	5122
2465	UUCCUUGG A CACAUAAG	2100	CTTATGTG GGCTAGCTACAACGA CCAAGGAA	5123
2467	CCUUGGAC A CAUAAGGU	2101	ACCTTATG GGCTAGCTACAACGA GTCCAAGG	5124
2469	UUGGACAC A UAAGGUGG	2102	CCACCTTA GGCTAGCTACAACGA GTGTCCAA	5125
2481	GGUGGGAA A CUUUACGG	2103	CCGTAAAG GGCTAGCTACAACGA TTCCCACC	5126
2486	GAAACUUU A CGGGGCUU	2104	AAGCCCCG GGCTAGCTACAACGA AAAGTTTC	5127
2496	GGGGCUUU A UUCUUCUA	2105	TAGAAGAA GGCTAGCTACAACGA AAAGCCCC	5128
2504	AUUCUUCU A CGGUACCU	2106	AGGTACCG GGCTAGCTACAACGA AGAAGAAT	5129
2509	UCUACGGU A CCUUGCUU	2107	AAGCAAGG GGCTAGCTACAACGA ACCGTAGA	5130
2520	UUGCUUUA A UCCUAAAU	2108	ATTTAGGA GGCTAGCTACAACGA TAAAGCAA	5131
2527	AAUCCUAA A UGGCAAAC	2109	GTTTGCCA GGCTAGCTACAACGA TTAGGATT	5132
2534	AAUGGCAA A CUCCUUCU	2110	AGAAGGAG GGCTAGCTACAACGA TTGCCATT	5133
2550	UUUUCCUG A CAUUCAUU	2111	AATGAATG GGCTAGCTACAACGA CAGGAAAA	5134
2552	UUCCUGAC A UUCAUUUG	2112	CAAATGAA GGCTAGCTACAACGA GTCAGGAA	5135
2556	UGACAUUC A UUUGCAGG	2113	CCTGCAAA GGCTAGCTACAACGA GAATGTCA	5136
2568	GCAGGAGG A CAUUGUUG	2114	CAACAATG GGCTAGCTACAACGA CCTCCTGC	5137
2570	AGGAGGAC A UUGUUGAU	2115	ATCAACAA GGCTAGCTACAACGA GTCCTCCT	5138
2577	CAUUGUUG A UAGAUGUA	2116	TACATCTA GGCTAGCTACAACGA CAACAATG	5139
2581	GUUGAUAG A UGUAAGCA	2117	TGCTTACA GGCTAGCTACAACGA CTATCAAC	5140
2590	UGUAAGCA A UUUGUGGG	2118	CCCACAAA GGCTAGCTACAACGA TGCTTACA	5141
2606	GGCCCCUU A CAGUAAAU	2119	ATTTACTG GGCTAGCTACAACGA AAGGGGCC	5142
2613	UACAGUAA A UGAAAACA	2120	TGTTTTCA GGCTAGCTACAACGA TTACTGTA	5143
2619	AAAUGAAA A CAGGAGAC	2121	GTCTCCTG GGCTAGCTACAACGA TTTCATTT	5144
2626	AACAGGAG A CUUAAAUU	2122	AATTTAAG GGCTAGCTACAACGA CTCCTGTT	5145
2632	AGACUUAA A UUAACUAU	2123	ATAGTTAA GGCTAGCTACAACGA TTAAGTCT	5146
2636	UUAAAUUA A CUAUGCCU	2124	AGGCATAG GGCTAGCTACAACGA TAATTTAA	5147
2639	AAUUAACU A UGCCUGCU	2125	AGCAGGCA GGCTAGCTACAACGA AGTTAATT	5148
2655	UAGGUUUU A UCCCAAUG	2126	CATTGGGA GGCTAGCTACAACGA AAAACCTA	5149
2661	UUAUCCCA A UGUUACUA	2127	TAGTAACA GGCTAGCTACAACGA TGGGATAA	5150
2666	CCAAUGUU A CUAAAUAU	2128	ATATTTAG GGCTAGCTACAACGA AACATTGG	5151
2671	GUUACUAA A UAUUUGCC	2129	GGCAAATA GGCTAGCTACAACGA TTAGTAAC	5152
2673	UACUAAAU A UUUGCCCU	2130	AGGGCAAA GGCTAGCTACAACGA ATTTAGTA	5153
2685	GCCCUUAG A UAAAGGGA	2131	TCCCTTTA GGCTAGCTACAACGA CTAAGGGC	5154
2693	AUAAAGGG A UCAAACCG	2132	CGGTTTGA GGCTAGCTACAACGA CCCTTTAT	5155
2698	GGGAUCAA A CCGUAUUA	2133	TAATACGG GGCTAGCTACAACGA TTGATCCC	5156
2703	CAAACCGU A UUAUCCAG	2134	CTGGATAA GGCTAGCTACAACGA ACGGTTTG	5157
2706	ACCGUAUU A UCCAGAGU	2135	ACTCTGGA GGCTAGCTACAACGA AATACGGT	5158
2715	UCCAGAGU A UGUAGUUA	2136	TAACTACA GGCTAGCTACAACGA ACTCTGGA	5159
2724	UGUAGUUA A UCAUUACU	2137	AGTAATGA GGCTAGCTACAACGA TAACTACA	5160
2727	AGUUAAUC A UUACUUCC	2138	GGAAGTAA GGCTAGCTACAACGA GATTAACT	5161
2730	UAAUCAUU A CUUCCAGA	2139	TCTGGAAG GGCTAGCTACAACGA AATGATTA	5162
2738	ACUUCCAG A CGCGACAU	2140	ATGTCGCG GGCTAGCTACAACGA CTGGAAGT	5163

Table 41

2743	CAGACGCG A CAUUAUUU	2141	AAATAATG GGCTAGCTACAACGA CGCGTCTG	5164
2745	GACGCGAC A UUAUUUAC	2142	GTAAATAA GGCTAGCTACAACGA GTCGCGTC	5165
2748	GCGACAUU A UUUACACA	2143	TGTGTAAA GGCTAGCTACAACGA AATGTCGC	5166
2752	CAUUAUUU A CACACUCU	2144	AGAGTGTG GGCTAGCTACAACGA AAATAATG	5167
2754	UUAUUUAC A CACUCUUU	2145	AAAGAGTG GGCTAGCTACAACGA GTAAATAA	5168
2756	AUUUACAC A CUCUUUGG	2146	CCAAAGAG GGCTAGCTACAACGA GTGTAAAT	5169
2774	AGGCGGGG A UCUUAUAU	2147	ATATAAGA GGCTAGCTACAACGA CCCCGCCT	5170
2779	GGGAUCUU A UAUAAAAG	2148	CTTTTATA GGCTAGCTACAACGA AAGATCCC	5171
2781	GAUCUUAU A UAAAAGAG	2149	CTCTTTTA GGCTAGCTACAACGA ATAAGATC	5172
2795	GAGAGUCC A CACGUAGC	2150	GCTACGTG GGCTAGCTACAACGA GGACTCTC	5173
2797	GAGUCCAC A CGUAGCGC	2151	GCGCTACG GGCTAGCTACAACGA GTGGACTC	5174
2809	AGCGCCUC A UUUUGCGG	2152	CCGCAAAA GGCTAGCTACAACGA GAGGCGCT	5175
2821	UGCGGGUC A CCAUAUUC	2153	GAATATGG GGCTAGCTACAACGA GACCCGCA	5176
2824	GGGUCACC A UAUUCUUG	2154	CAAGAATA GGCTAGCTACAACGA GGTGACCC	5177
2826	GUCACCAU A UUCUUGGG	2155	CCCAAGAA GGCTAGCTACAACGA ATGGTGAC	5178
2836	UCUUGGGA A CAAGAUCU	2156	AGATCTTG GGCTAGCTACAACGA TCCCAAGA	5179
2841	GGAACAAG A UCUACAGC	2157	GCTGTAGA GGCTAGCTACAACGA CTTGTTCC	5180
2845	CAAGAUCU A CAGCAUGG	2158	CCATGCTG GGCTAGCTACAACGA AGATCTTG	5181
2850	UCUACAGC A UGGGAGGU	2159	ACCTCCCA GGCTAGCTACAACGA GCTGTAGA	5182
2870	UCUUCCAA A CCUCGAAA	2160	TTTCGAGG GGCTAGCTACAACGA TTGGAAGA	5183
2883	GAAAAGGC A UGGGGACA	2161	TGTCCCCA GGCTAGCTACAACGA GCCTTTTC	5184
2889	GCAUGGGG A CAAAUCUU	2162	AAGATTTG GGCTAGCTACAACGA CCCCATGC	5185
2893	GGGGACAA A UCUUUCUG	2163	CAGAAAGA GGCTAGCTACAACGA TTGTCCCC	5186
2908	UGUCCCCA A UCCCCUGG	2164	CCAGGGGA GGCTAGCTACAACGA TGGGGACA	5187
2918	CCCCUGGG A UUCUUCCC	2165	GGGAAGAA GGCTAGCTACAACGA CCCAGGGG	5188
2929	CUUCCCCG A UCAUCAGU	2166	ACTGATGA GGCTAGCTACAACGA CGGGGAAG	5189
2932	CCCCGAUC A UCAGUUGG	2167	CCAACTGA GGCTAGCTACAACGA GATCGGGG	5190
2941	UCAGUUGG A CCCUGCAU	2168	ATGCAGGG GGCTAGCTACAACGA CCAACTGA	5191
2948	GACCCUGC A UUCAAAGC	2169	GCTTTGAA GGCTAGCTACAACGA GCAGGGTC	5192
2959	CAAAGCCA A CUCAGUAA	2170	TTACTGAG GGCTAGCTACAACGA TGGCTTTG	5193
2968	CUCAGUAA A UCCAGAUU	2171	AATCTGGA GGCTAGCTACAACGA TTACTGAG	5194
2974	AAAUCCAG A UUGGGACC	2172	GGTCCCAA GGCTAGCTACAACGA CTGGATTT	5195
2980	AGAUUGGG A CCUCAACC	2173	GGTTGAGG GGCTAGCTACAACGA CCCAATCT	5196
2986	GGACCUCA A CCCGCACA	2174	TGTGCGGG GGCTAGCTACAACGA TGAGGTCC	5197
2998	GCACAAGG A CAACUGGC	2175	GCCAGTTG GGCTAGCTACAACGA CCTTGTGC	5198
3001	CAAGGACA A CUGGCCGG	2176	CCGGCCAG GGCTAGCTACAACGA TGTCCTTG	5199
3010	CUGGCCGG A CGCCAACA	2177	TGTTGGCG GGCTAGCTACAACGA CCGGCCAG	5200
3016	GGACGCCA A CAAGGUGG	2178	CCACCTTG GGCTAGCTACAACGA TGGCGTCC	5201
3035	GUGGGAGC A UUCGGGCC	2179	GGCCCGAA GGCTAGCTACAACGA GCTCCCAC	5202
3051	CAGGGUUC A CCCCUCCC	2180	GGGAGGGG GGCTAGCTACAACGA GAACCCTG	5203
3061	CCCUCCCC A UGGGGGAC	2181	GTCCCCCA GGCTAGCTACAACGA GGGGAGGG	5204
3068	CAUGGGGG A CUGUUGGG	2182	CCCAACAG GGCTAGCTACAACGA CCCCCATG	5205
3088	GAGCCCUC A CGCUCAGG	2183	CCTGAGCG GGCTAGCTACAACGA GAGGGCTC	5206
3101	CAGGGCCU A CUCACAAC	2184	GTTGTGAG GGCTAGCTACAACGA AGGCCCTG	5207
3105	GCCUACUC A CAACUGUG	2185	CACAGTTG GGCTAGCTACAACGA GAGTAGGC	5208
3108	UACUCACA A CUGUGCCA	2186	TGGCACAG GGCTAGCTACAACGA TGTGAGTA	5209
3138	CUGCCUCC A CCAAUCGG	2187	CCGATTGG GGCTAGCTACAACGA GGAGGCAG	5210
3142	CUCCACCA A UCGGCAGU	2188	ACTGCCGA GGCTAGCTACAACGA TGGTGGAG	5211
3165	GGCAGCCU A CUCCCUUA	2189	TAAGGGAG GGCTAGCTACAACGA AGGCTGCC	5212
3173	ACUCCCUU A UCUCCACC	2190	GGTGGAGA GGCTAGCTACAACGA AAGGGAGT	5213
3179	UUAUCUCC A CCUCUAAG	2191	CTTAGAGG GGCTAGCTACAACGA GGAGATAA	5214

Table 41

3190	UCUAAGGG A CACUCAUC	2192	GATGAGTG GGCTAGCTACAACGA CCCTTAGA	5215
3192	UAAGGGAC A CUCAUCCU	2193	AGGATGAG GGCTAGCTACAACGA GTCCCTTA	5216
3196	GGACACUC A UCCUCAGG	2194	CCTGAGGA GGCTAGCTACAACGA GAGTGTCC	5217
3207	CUCAGGCC A UGCAGUGG	2195	CCACTGCA GGCTAGCTACAACGA GGCCTGAG	5218

Input Sequence = AF100308. Cut Site = YG/M or UG/U.
Stem Length = 8 . Core Sequence = GGCTAGCTACAACGA
AF100308 (Hepatitis B virus strain 2-18, 3215 bp)

Table 42

Table 42: Human HBV Amberzyme Ribozyme and Substrate Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
61	ACUUUCCU G CUGGUGGC	1448	GCCACCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAAAGU	5219
87	GGAACAGU G AGCCCUGC	1449	GCAGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGUUCC	5220
94	UGAGCCCU G CUCAGAAU	1450	AUUCUGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGCUCA	5221
112	CUGUCUCU G CCAUAUCG	1451	CGAUAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGACAG	5222
132	AUCUUAUC G AAGACUGG	1452	CCAGUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUAAGAU	5223
153	CCUGUACC G AACAUGGA	1453	UCCAUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUACAGG	5224
169	AGAACAUC G CAUCAGGA	1454	UCCUGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUGUUCU	5225
192	GGACCCCU G CUCGUGUU	1455	AACACGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGUCC	5226
222	UUCUUGUU G ACAAAAAU	1456	AUUUUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAAGAA	5227
315	CAAAAUUC G CAGUCCCA	1457	UGGGACUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAAUUUUG	5228
374	UGGUUAUC G CUGGAUGU	1458	ACAUCCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUAACCA	5229
387	AUGUGUCU G CGGCGUUU	1459	AAACGCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGACACAU	5230
410	CUUCCUCU G CAUCCUGC	1460	GCAGGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGGAAG	5231
417	UGCAUCCU G CUGCUAUG	1461	CAUAGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAUGCA	5232
420	AUCCUGCU G CUAUGCCU	1462	AGGCAUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGGAU	5233
425	GCUGCUAU G CCUCAUCU	1463	AGAUGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGCAGC	5234
468	GGUAUGUU G CCCGUUUG	1464	CAAACGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAUACC	5235
518	CGGACCAU G CAAAACCU	1465	AGGUUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGUCCG	5236
527	CAAAACCU G CACAACUC	1466	GAGUUGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUUUUG	5237
538	CAACUCCU G CUCAAGGA	1467	UCCUUGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAGUUG	5238
569	CUCAUGUU G CUGUACAA	1468	UUGUACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAUGAG	5239
596	CGGAAACU G CACCUGUA	1469	UACAGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUUCCG	5240
631	GGGCUUUC G CAAAAUAC	1470	GUAUUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAAAGCCC	5241
687	UUACUAGU G CCAUUUGU	1471	ACAAAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUAGUAA	5242
747	AUAUGGAU G AUGUGGUU	1472	AACCACAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCCAUAU	5243
783	AACAUCUU G AGUCCCUU	1473	AAGGGACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAUGUU	5244
795	CCCUUUAU G CCGCUGUU	1474	AACAGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAAAGGG	5245
798	UUUAUGCC G CUGUUACC	1475	GGUAACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCAUAAA	5246
911	GGCACAUU G CCACAGGA	1476	UCCUGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGUGCC	5247
978	GGCCUAUU G AUUGGAAA	1477	UUUCCAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUAGGCC	5248

Table 42

997	AUGUCAAC G AAUUGUGG	1478	CCACAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUGACAU	5249
1020	UGGGGUUU G CCGCCCCU	1479	AGGGGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAACCCCA	5250
1023	GGUUUGCC G CCCCUUUC	1480	GAAAGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCAAACC	5251
1034	CCUUUCAC G CAAUGUGG	1481	CCACAUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGAAAGG	5252
1050	GAUAUUCU G CUUUAAUG	1482	CAUUAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAUAUC	5253
1058	GCUUUAAU G CCUUUAUA	1483	UAUAAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUAAAGC	5254
1068	CUUUAUAU G CAUGCAUA	1484	UAUGCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUAAAG	5255
1072	AUAUGCAU G CAUACAAG	1485	CUUGUAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCAUAU	5256
1103	ACUUUCUC G CCAACUUA	1486	UAAGUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGAAAGU	5257
1139	CAGUAUGU G AACCUUUA	1487	UAAAGGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUACUG	5258
1155	ACCCCGUU G CUCGGCAA	1488	UUGCCGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACGGGGU	5259
1177	UGGUCUAU G CCAAGUGU	1489	ACACUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGACCA	5260
1188	AAGUGUUU G CUGACGCA	1490	UGCGUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAACACUU	5261
1191	UGUUUGCU G ACGCAACC	1491	GGUUGCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAAACA	5262
1194	UUGCUGAC G CAACCCCC	1492	GGGGGUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCAGCAA	5263
1234	CCAUCAGC G CAUGCGUG	1493	CACGCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCUGAUGG	5264
1238	CAGCGCAU G CGUGGAAC	1494	GUUCCACG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCGCUG	5265
1262	UCUCCUCU G CCGAUCCA	1495	UGGAUCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGGAGA	5266
1265	CCUCUGCC G AUCCAUAC	1496	GUAUGGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCAGAGG	5267
1275	UCCAUACC G CGGAACUC	1497	GAGUUCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUAUGGA	5268
1290	UCCUAGCC G CUUGUUUU	1498	AAAACAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCUAGGA	5269
1299	CUUGUUUU G CUCGCAGC	1499	GCUGCGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAACAAG	5270
1303	UUUUGCUC G CAGCAGGU	1500	ACCUGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGCAAAA	5271
1335	UCGGGACU G ACAAUUCU	1501	AGAAUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCCCGA	5272
1349	UCUGUCGU G CUCUCCCG	1502	CGGGAGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGACAGA	5273
1357	GCUCUCCC G CAAAUAUA	1503	UAUAUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGAGAGC	5274
1382	CCAUGGCU G CUAGGCUG	1504	CAGCCUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCAUGG	5275
1392	UAGGCUGU G CUGCCAAC	1505	GUUGGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGCCUA	5276
1395	GCUGUGCU G CCAACUGG	1506	CCAGUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCACAGC	5277
1411	GAUCCUAC G CGGGACGU	1507	ACGUCCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAGGAUC	5278
1442	CCGUCGGC G CUGAAUCC	1508	GGAUUCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCGACGG	5279
1445	UCGGCGCU G AAUCCCGC	1509	GCGGGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCGCCGA	5280
1452	UGAAUCCC G CGGACGAC	1510	GUCGUCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGAUUCA	5281
1458	CCGCGGAC G ACCCCUCC	1511	GGAGGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCCGCGG	5282

Table 42

1474	CCGGGGCC G CUUGGGGC	1512	GCCCCAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCCCCGG	5283
1489	GCUCUACC G CCCGCUUC	1513	GAAGCGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUAGAGC	5284
1493	UACCGCCC G CUUCUCCG	1514	CGGAGAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCGGUA	5285
1501	GCUUCUCC G CCUAUUGU	1515	ACAAUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAGAAGC	5286
1513	AUUGUACC G ACCGUCCA	1516	UGGACGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUACAAU	5287
1528	CACGGGGC G CACCUCUC	1517	GAGAGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCCCGUG	5288
1542	CUCUUUAC G CGGACUCC	1518	GGAGUCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAAAGAG	5289
1559	CCGUCUGU G CCUUCUCA	1519	UGAGAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGACGG	5290
1571	UCUCAUCU G CCGGACCG	1520	CGGUCCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAUGAGA	5291
1583	GACCGUGU G CACUUCGC	1521	GCGAAGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACGGUC	5292
1590	UGCACUUC G CUUCACCU	1522	AGGUGAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAAGUGCA	5293
1601	UCACCUCU G CACGUCGC	1523	GCGACGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGGUGA	5294
1608	UGCACGUC G CAUGGAGA	1524	UCUCCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GACGUGCA	5295
1624	ACCACCGU G AACGCCCA	1525	UGGGCGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGGUGGU	5296
1628	CCGUGAAC G CCCACAGG	1526	CCUGUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUCACGG	5297
1642	AGGAACCU G CCCAAGGU	1527	ACCUUGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUUCCU	5298
1654	AAGGUCUU G CAUAAGAG	1528	CUCUUAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGACCUU	5299
1690	AUGUCAAC G ACCGACCU	1529	AGGUCGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUGACAU	5300
1694	CAACGACC G ACCUUGAG	1530	CUCAAGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUCGUUG	5301
1700	CCGACCUU G AGGCAUAC	1531	GUAUGCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGUCGG	5302
1730	UGUUUAAU G AGUGGGAG	1532	CUCCCACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUAAACA	5303
1818	AGCACCAU G CAACUUUU	1533	AAAAGUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGUGCU	5304
1835	UCACCUCU G CCUAAUCA	1534	UGAUUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGGUGA	5305
1883	CAAGCUGU G CCUUGGGU	1535	ACCCAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGCUUG	5306
1912	UGGACAUU G ACCCGUAU	1536	AUACGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGUCCA	5307
1959	UCUUUUUU G CCUUCUGA	1537	UCAGAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAAAGA	5308
1966	UGCCUUCU G ACUUCUUU	1538	AAAGAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAGGCA	5309
1985	UUCUAUUC G AGAUCUCC	1539	GGAGAUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAAUAGAA	5310
1996	AUCUCCUC G ACACCGCC	1540	GGCGGUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGGAGAU	5311
2002	UCGACACC G CCUCUGCU	1541	AGCAGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUGUCGA	5312
2008	CCGCCUCU G CUCUGUAU	1542	AUACAGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGGCGG	5313
2092	GUUGGGGU G AGUUGAUG	1543	CAUCAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCCAAC	5314
2097	GGUGAGUU G AUGAAUCU	1544	AGAUUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACUCACC	5315
2100	GAGUUGAU G AAUCUAGC	1545	GCUAGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAACUC	5316

Table 42

2237	UUUUGGGC G AGAAACUG	1546	CAGUUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCCAAAA	5317
2251	CUGUUCUU G AAUAUUUG	1547	CAAAUAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAACAG	5318
2282	GUGGAUUC G CACUCCUC	1548	GAGGAGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAAUCCAC	5319
2293	CUCCUCCU G CAUAUAGA	1549	UCUAUAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAGGAG	5320
2311	CACCAAAU G CCCCUAUC	1550	GAUAGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUGGUG	5321
2354	UGUUAGAC G AAGAGGCA	1551	UGCCUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCUAACA	5322
2388	ACUCCCUC G CCUCGCAG	1552	CUGCGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGGGAGU	5323
2393	CUCGCCUC G CAGACGAA	1553	UUCGUCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGGCGAG	5324
2399	UCGCAGAC G AAGGUCUC	1554	GAGACCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCUGCGA	5325
2412	UCUCAAUC G CCGCGUCG	1555	CGACGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUUGAGA	5326
2415	CAAUCGCC G CGUCGCAG	1556	CUGCGACG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCGAUUG	5327
2420	GCCGCGUC G CAGAAGAU	1557	AUCUUCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GACGCGGC	5328
2514	GGUACCUU G CUUUAAUC	1558	GAUUAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGUACC	5329
2549	CUUUUCCU G ACAUUCAU	1559	AUGAAUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAAAAG	5330
2560	AUUCAUUU G CAGGAGGA	1560	UCCUCCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUGAAU	5331
2576	ACAUUGUU G AUAGAUGU	1561	ACAUCUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAAUGU	5332
2615	CAGUAAAU G AAAACAGG	1562	CCUGUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUACUG	5333
2641	UUAACUAU G CCUGCUAG	1563	CUAGCAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGUUAA	5334
2645	CUAUGCCU G CUAGGUUU	1564	AAACCUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGCAUAG	5335
2677	AAAUAUUU G CCCUUAGA	1565	UCUAAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUAUUU	5336
2740	UUCCAGAC G CGACAUUA	1566	UAAUGUCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCUGGAA	5337
2742	CCAGACGC G ACAUUAUU	1567	AAUAAUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGUCUGG	5338
2804	CACGUAGC G CCUCAUUU	1568	AAAUGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCUACGUG	5339
2814	CUCAUUUU G CGGGUCAC	1569	GUGACCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAUGAG	5340
2875	CAAACCUC G AAAAGGCA	1570	UGCCUUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGGUUUG	5341
2928	UCUUCCCC G AUCAUCAG	1571	CUGAUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGGAAGA	5342
2946	UGGACCCU G CAUUCAAA	1572	UUUGAAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGUCCA	5343
2990	CUCAACCC G CACAAGGA	1573	UCCUUGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGUUGAG	5344
3012	GGCCGGAC G CCAACAAG	1574	CUUGUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCCGGCC	5345
3090	GCCCUCAC G CUCAGGGC	1575	GCCCUGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGAGGGC	5346
3113	ACAACUGU G CCAGCAGC	1576	GCUGCUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGUUGU	5347
3132	CUCCUCCU G CCUCCACC	1577	GGUGGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAGGAG	5348
51	AGGGCCCU G UACUUUCC	1578	GGAAAGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGCCCU	5349
106	AGAAUACU G UCUCUGCC	1579	GGCAGAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUAUUCU	5350

Table 42

148	GGACCCU G UACCGAAC	1580	GUUCGGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGUCCC	5351
198	CUGCUCGU G UUACAGGC	1581	GCCUGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGAGCAG	5352
219	UUUUUCUU G UUGACAAA	1582	UUUGUCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAAAAA	5353
297	ACACCCGU G UGUCUUGG	1583	CCAAGACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGGGUGU	5354
299	ACCCGUGU G UCUUGGCC	1584	GGCCAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACGGGU	5355
347	ACCAACCU G UUGUCCUC	1585	GAGGACAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUUGGU	5356
350	AACCUGUU G UCCUCCAA	1586	UUGGAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAGGUU	5357
362	UCCAAUUU G UCCUGGUU	1587	AACCAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUUGGA	5358
381	CGCUGGAU G UGUCUGCG	1588	CGCAGACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCCAGCG	5359
383	CUGGAUGU G UCUGCGGC	1589	GCCGCAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUCCAG	5360
438	AUCUUCUU G UUGGUUCU	1590	AGAACCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAAGAU	5361
465	CAAGGUAU G UUGCCCGU	1591	ACGGGCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUACCUUG	5362
476	GCCCGUUU G UCCUCUAA	1592	UUAGAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAACGGGC	5363
555	ACCUCUAU G UUUCCCUC	1593	GAGGGAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGAGGU	5364
566	UCCCUCAU G UUGCUGUA	1594	UACAGCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAGGGA	5365
572	AUGUUGCU G UACAAAAC	1595	GUUUUGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAACAU	5366
602	CUGCACCU G UAUUCCCA	1596	UGGGAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUGCAG	5367
694	UGCCAUUU G UUCAGUGG	1597	CCACUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUGGCA	5368
724	CCCCCACU G UCUGGCUU	1598	AAGCCAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGGGGG	5369
750	UGGAUGAU G UGGUUUUG	1599	CAAAACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCAUCCA	5370
771	CCAAGUCU G UACAACAU	1600	AUGUUGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGACUUGG	5371
801	AUGCCGCU G UUACCAAU	1601	AUUGGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCGGCAU	5372
818	UUUCUUUU G UCUUUGGG	1602	CCCAAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAGAAA	5373
888	UGGGAUAU G UAAUUGGG	1603	CCCAAUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUCCCA	5374
927	AACAUAUU G UACAAAAA	1604	UUUUUGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUAUGUU	5375
944	AUCAAAAU G UGUUUUAG	1605	CUAAAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUUGAU	5376
946	CAAAAUGU G UUUUAGGA	1606	UCCUAAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUUUUG	5377
963	AACUUCCU G UAAACAGG	1607	CCUGUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAAGUU	5378
991	GAAAGUAU G UCAACGAA	1608	UUCGUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUACUUUC	5379
1002	AACGAAUU G UGGGUCUU	1609	AAGACCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUUCGUU	5380
1039	CACGCAAU G UGGAUAUU	1610	AAUAUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUGCGUG	5381
1137	AACAGUAU G UGAACCUU	1611	AAGGUUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUACUGUU	5382
1184	UGCCAAGU G UUUGCUGA	1612	UCAGCAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUUGGCA	5383
1251	GAACCUUU G UGUCUCCU	1613	AGGAGACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGGUUC	5384

Table 42

1253	ACCUUUGU G UCUCCUCU	1614	AGAGGAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAAGGU	5385
1294	AGCCGCUU G UUUUGCUC	1615	GAGCAAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGCGGCU	5386
1344	ACAAUUCU G UCGUGCUC	1616	GAGCACGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAUUGU	5387
1390	GCUAGGCU G UGCUGCCA	1617	UGGCAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCUAGC	5388
1425	CGUCCUUU G UUUACGUC	1618	GACGUAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGGACG	5389
1508	CGCCUAUU G UACCGACC	1619	GGUCGGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUAGGCG	5390
1557	CCCCGUCU G UGCCUUCU	1620	AGAAGGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGACGGGG	5391
1581	CGGACCGU G UGCACUUC	1621	GAAGUGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGGUCCG	5392
1684	UCAGCAAU G UCAACGAC	1622	GUCGUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUGCUGA	5393
1719	CAAAGACU G UGUGUUUA	1623	UAAACACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCUUUG	5394
1721	AAGACUGU G UGUUUAAU	1624	AUUAAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGUCUU	5395
1723	GACUGUGU G UUUAAUGA	1625	UCAUUAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACAGUC	5396
1772	AGGUCUUU G UACUAGGA	1626	UCCUAGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGACCU	5397
1785	AGGAGGCU G UAGGCAUA	1627	UAUGCCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCCUCCU	5398
1801	AAAUUGGU G UGUUCACC	1628	GGUGAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAAUUU	5399
1803	AUUGGUGU G UUCACCAG	1629	CUGGUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACCAAU	5400
1850	CAUCUCAU G UUCAUGUC	1630	GACAUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAGAUG	5401
1856	AUGUUCAU G UCCUACUG	1631	CAGUAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAACAU	5402
1864	GUCCUACU G UUCAAGCC	1632	GGCUUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUAGGAC	5403
1881	UCCAAGCU G UGCCUUGG	1633	CCAAGGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCUUGGA	5404
1939	GAGCUUCU G UGGAGUUA	1634	UAACUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAGCUC	5405
2013	UCUGCUCU G UAUCGGGG	1635	CCCCGAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAGCAGA	5406
2045	GGAACAUU G UUCACCUC	1636	GAGGUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGUUCC	5407
2082	GCUAUUCU G UGUUGGGG	1637	CCCCAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAUAGC	5408
2084	UAUUCUGU G UUGGGGUG	1638	CACCCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGAAUA	5409
2167	UCAGCUAU G UCAACGUU	1639	AACGUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGCUGA	5410
2205	CAACUAUU G UGGUUUCA	1640	UGAAACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUAGUUG	5411
2222	CAUUUCCU G UCUUACUU	1641	AAGUAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGAAAUG	5412
2245	GAGAAACU G UUCUUGAA	1642	UUCAAGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUUCUC	5413
2262	UAUUUGGU G UCUUUUGG	1643	CCAAAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAAAUA	5414
2274	UUUGGAGU G UGGAUUCG	1644	CGAAUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUCCAAA	5415
2344	AAACUACU G UUGUUAGA	1645	UCUAACAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUAGUUU	5416
2347	CUACUGUU G UUAGACGA	1646	UCGUCUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAGUAG	5417
2450	AUCUCAAU G UUAGUAUU	1647	AAUACUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUGAGAU	5418

Table 42

2573	AGGACAUU G UUGAUAGA	1648	UCUAUCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUGUCCU	5419
2583	UGAUAGAU G UAAGCAAU	1649	AUUGCUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUAUCA	5420
2594	AGCAAUUU G UGGGGCCC	1650	GGGCCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUUGCU	5421
2663	AUCCCAAU G UUACUAAA	1651	UUUAGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUGGGAU	5422
2717	CAGAGUAU G UAGUUAAU	1652	AUUAACUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUACUCUG	5423
2901	AUCUUUCU G UCCCCAAU	1653	AUUGGGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAAGAU	5424
3071	GGGGACU G UUGGGGUG	1654	CACCCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCCCCC	5425
3111	UCACAACU G UGCCAGCA	1655	UGCUGGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUGUGA	5426
40	AUCCCAGA G UCAGGGCC	1656	GGCCCUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUGGGAU	5427
46	GAGUCAGG G CCCUGUAC	1657	GUACAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGACUC	5428
65	UCCUGCUG G UGGCUCCA	1658	UGGAGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCAGGA	5429
68	UGCUGGUG G CUCCAGUU	1659	AACUGGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCAGCA	5430
74	UGGCUCCA G UUCAGGAA	1660	UUCCUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAGCCA	5431
85	CAGGAACA G UGAGCCCU	1661	AGGGCUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUCCUG	5432
89	AACAGUGA G CCCUGCUC	1662	GAGCAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCACUGUU	5433
120	GCCAUAUC G UCAAUCUU	1663	AAGAUUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUAUGGC	5434
196	CCCUGCUC G UGUUACAG	1664	CUGUAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGCAGGG	5435
205	UGUUACAG G CGGGGUUU	1665	AAACCCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUAACA	5436
210	CAGGCGGG G UUUUUCUU	1666	AAGAAAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGCCUG	5437
248	ACCACAGA G UCUAGACU	1667	AGUCUAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUGUGGU	5438
258	CUAGACUC G UGGUGGAC	1668	GUCCACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGUCUAG	5439
261	GACUCGUG G UGGACUUC	1669	GAAGUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACGAGUC	5440
295	GAACACCC G UGUGUCUU	1670	AAGACACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGUGUUC	5441
305	GUGUCUUG G CCAAAAUU	1671	AAUUUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGACAC	5442
318	AAUUCGCA G UCCCAAAU	1672	AUUUGGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGAAUU	5443
332	AAUCUCCA G UCACUCAC	1673	GUGAGUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAGAUU	5444
368	UUGUCCUG G UUAUCGCU	1674	AGCGAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGACAA	5445
390	UGUCUGCG G CGUUUUAU	1675	AUAAAACG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCAGACA	5446
392	UCUGCGGC G UUUUAUCA	1676	UGAUAAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCGCAGA	5447
442	UCUUGUUG G UUCUUCUG	1677	CAGAAGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACAAGA	5448
461	CUAUCAAG G UAUGUUGC	1678	GCAACAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGAUAG	5449
472	UGUUGCCC G UUUGUCCU	1679	AGGACAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGCAACA	5450
506	AACAACCA G CACCGGAC	1680	GUCCGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGUUGUU	5451
625	CAUCUUGG G CUUUCGCA	1681	UGCGAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAGAUG	5452

Table 42

648	CUAUGGGA G UGGGCCUC	1682	GAGGCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCAUAG	5453
652	GGGAGUGG G CCUCAGUC	1683	GACUGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACUCCC	5454
658	GGGCCUCA G UCCGUUUC	1684	GAAACGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGGCCC	5455
662	CUCAGUCC G UUUCUCUU	1685	AAGAGAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGACUGAG	5456
672	UUCUCUUG G CUCAGUUU	1686	AAACUGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGAGAA	5457
677	UUGGCUCA G UUUACUAG	1687	CUAGUAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGCCAA	5458
685	GUUUACUA G UGCCAUUU	1688	AAAUGGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGUAAAC	5459
699	UUUGUUCA G UGGUUCGU	1689	ACGAACCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAACAAA	5460
702	GUUCAGUG G UUCGUAGG	1690	CCUACGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUGAAC	5461
706	AGUGGUUC G UAGGGCUU	1691	AAGCCCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAACCACU	5462
711	UUCGUAGG G CUUUCCCC	1692	GGGGAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUACGAA	5463
729	ACUGUCUG G CUUUCAGU	1693	ACUGAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGACAGU	5464
736	GGCUUUCA G UUAUAUGG	1694	CCAUAUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAAAGCC	5465
753	AUGAUGUG G UUUUGGGG	1695	CCCCAAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAUCAU	5466
762	UUUUGGGG G CCAAGUCU	1696	AGACUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCAAAA	5467
767	GGGGCCAA G UCUGUACA	1697	UGUACAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGCCCC	5468
785	CAUCUUGA G UCCCUUUA	1698	UAAAGGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAAGAUG	5469
826	GUCUUUGG G UAUACAUU	1699	AAUGUAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAAGAC	5470
898	AAUUGGGA G UUGGGGCA	1700	UGCCCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCAAUU	5471
904	GAGUUGGG G CACAUUGC	1701	GCAAUGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAACUC	5472
971	GUAAACAG G CCUAUUGA	1702	UCAAUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUUUAC	5473
987	AUUGGAAA G UAUGUCAA	1703	UUGACAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUCCAAU	5474
1006	AAUUGUGG G UCUUUUGG	1704	CCAAAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACAAUU	5475
1016	CUUUUGGG G UUUGCCGC	1705	GCGGCAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAAAAG	5476
1080	GCAUACAA G CAAAACAG	1706	CUGUUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUAUGC	5477
1089	CAAAACAG G CUUUUACU	1707	AGUAAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUUUUG	5478
1116	CUUACAAG G CCUUUCUA	1708	UAGAAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGUAAG	5479
1126	CUUUCUAA G UAAACAGU	1709	ACUGUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAGAAAG	5480
1133	AGUAAACA G UAUGUGAA	1710	UUCACAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUUACU	5481
1152	UUUACCCC G UUGCUCGG	1711	CCGAGCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGGUAAA	5482
1160	GUUGCUCG G CAACGGCC	1712	GGCCGUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGAGCAAC	5483
1166	CGGCAACG G CCUGGUCU	1713	AGACCAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUUGCCG	5484
1171	ACGGCCUG G UCUAUGCC	1714	GGCAUAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGCCGU	5485
1182	UAUGCCAA G UGUUUGCU	1715	AGCAAACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGCAUA	5486

Table 42

1207	CCCCACUG G UUGGGGCU	1716	AGCCCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGUGGGG	5487
1213	UGGUUGGG G CUUGGCCA	1717	UGGCCAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAACCA	5488
1218	GGGGCUUG G CCAUAGGC	1718	GCCUAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGCCCC	5489
1225	GGCCAUAG G CCAUCAGC	1719	GCUGAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAUGGCC	5490
1232	GGCCAUCA G CGCAUGCG	1720	CGCAUGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAUGGCC	5491
1240	GCGCAUGC G UGGAACCU	1721	AGGUUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAUGCGC	5492
1287	AACUCCUA G CCGCUUGU	1722	ACAAGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGGAGUU	5493
1306	UGCUCGCA G CAGGUCUG	1723	CAGACCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGAGCA	5494
1310	CGCAGCAG G UCUGGGGC	1724	GCCCCAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCUGCG	5495
1317	GGUCUGGG G CAAAACUC	1725	GAGUUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAGACC	5496
1347	AUUCUGUC G UGCUCUCC	1726	GGAGAGCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GACAGAAU	5497
1379	UUUCCAUG G CUGCUAGG	1727	CCUAGCAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGGAAA	5498
1387	GCUGCUAG G CUGUGCUG	1728	CAGCACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAGCAGC	5499
1418	CGCGGGAC G UCCUUUGU	1729	ACAAAGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCCCGCG	5500
1431	UUGUUUAC G UCCCGUCG	1730	CGACGGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAAACAA	5501
1436	UACGUCCC G UCGGCGCU	1731	AGCGCCGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGACGUA	5502
1440	UCCCGUCG G CGCUGAAU	1732	AUUCAGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGACGGGA	5503
1471	CUCCCGGG G CCGCUUGG	1733	CCAAGCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGGGAG	5504
1481	CGCUUGGG G CUCUACCG	1734	CGGUAGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAAGCG	5505
1517	UACCGACC G UCCACGGG	1735	CCCGUGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUCGGUA	5506
1526	UCCACGGG G CGCACCUC	1736	GAGGUGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGUGGA	5507
1553	GACUCCCC G UCUGUGCC	1737	GGCACAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGGAGUC	5508
1579	GCCGGACC G UGUGCACU	1738	AGUGCACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUCCGGC	5509
1605	CUCUGCAC G UCGCAUGG	1739	CCAUGCGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGCAGAG	5510
1622	AGACCACC G UGAACGCC	1740	GGCGUUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUGGUCU	5511
1649	UGCCCAAG G UCUUGCAU	1741	AUGCAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGGGCA	5512
1679	GACUUUCA G CAAUGUCA	1742	UGACAUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAAAGUC	5513
1703	ACCUUGAG G CAUACUUC	1743	GAAGUAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCAAGGU	5514
1732	UUUAAUGA G UGGGAGGA	1744	UCCUCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAUUAAA	5515
1741	UGGGAGGA G UUGGGGGA	1745	UCCCCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUCCCA	5516
1754	GGGAGGAG G UUAGGUUA	1746	UAACCUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCUCCC	5517
1759	GAGGUUAG G UUAAAGGU	1747	ACCUUUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAACCUC	5518
1766	GGUUAAAG G UCUUUGUA	1748	UACAAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUUAACC	5519
1782	ACUAGGAG G CUGUAGGC	1749	GCCUACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCUAGU	5520

Table 42

1789	GGCUGUAG G CAUAAAUU	1750	AAUUUAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUACAGCC	5521
1799	AUAAAUUG G UGUGUUCA	1751	UGAACACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAUUUAU	5522
1811	GUUCACCA G CACCAUGC	1752	GCAUGGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGUGAAC	5523
1870	CUGUUCAA G CCUCCAAG	1753	CUUGGAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGAACAG	5524
1878	GCCUCCAA G CUGUGCCU	1754	AGGCACAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGAGGC	5525
1890	UGCCUUGG G UGGCUUUG	1755	CAAAGCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAGGCA	5526
1893	CUUGGGUG G CUUUGGGG	1756	CCCCAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCCAAG	5527
1901	GCUUUGGG G CAUGGACA	1757	UGUCCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAAAGC	5528
1917	AUUGACCC G UAUAAAGA	1758	UCUUUAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGUCAAU	5529
1933	AAUUUGGA G CUUCUGUG	1759	CACAGAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAAAUU	5530
1944	UCUGUGGA G UUACUCUC	1760	GAGAGUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCACAGA	5531
2023	AUCGGGGG G CCUUAGAG	1761	CUCUAAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCCGAU	5532
2031	GCCUUAGA G UCUCCGGA	1762	UCCGGAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUAAGGC	5533
2062	ACCAUACG G CACUCAGG	1763	CCUGAGUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUAUGGU	5534
2070	GCACUCAG G CAAGCUAU	1764	AUAGCUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGAGUGC	5535
2074	UCAGGCAA G CUAUUCUG	1765	CAGAAUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGCCUGA	5536
2090	GUGUUGGG G UGAGUUGA	1766	UCAACUCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAACAC	5537
2094	UGGGGUGA G UUGAUGAA	1767	UUCAUCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCACCCCA	5538
2107	UGAAUCUA G CCACCUGG	1768	CCAGGUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGAUUCA	5539
2116	CCACCUGG G UGGGAAGU	1769	ACUUCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGGUGG	5540
2123	GGUGGGAA G UAAUUUGG	1770	CCAAAUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCCACC	5541
2140	AAGAUCCA G CAUCCAGG	1771	CCUGGAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAUCUU	5542
2155	GGGAAUUA G UAGUCAGC	1772	GCUGACUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAUUCCC	5543
2158	AAUUAGUA G UCAGCUAU	1773	AUAGCUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACUAAUU	5544
2162	AGUAGUCA G CUAUGUCA	1774	UGACAUAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGACUACU	5545
2173	AUGUCAAC G UUAAUAUG	1775	CAUAUUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUGACAU	5546
2183	UAAUAUGG G CCUAAAAA	1776	UUUUUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUAUUA	5547
2208	CUAUUGUG G UUUCACAU	1777	AUGUGAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAAUAG	5548
2235	ACUUUUGG G CGAGAAAC	1778	GUUUCUCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAAAGU	5549
2260	AAUAUUUG G UGUCUUUU	1779	AAAAGACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAUAUU	5550
2272	CUUUUGGA G UGUGGAUU	1780	AAUCCACA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAAAAG	5551
2360	ACGAAGAG G CAGGUCCC	1781	GGGACCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCUUCGU	5552
2364	AGAGGCAG G UCCCCUAG	1782	CUAGGGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCCUCU	5553
2403	AGACGAAG G UCUCAAUC	1783	GAUUGAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCGUCU	5554

Table 42

2417	AUCGCCGC G UCGCAGAA	1784	UUCUGCGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGGCGAU	5555
2454	CAAUGUUA G UAUUCCUU	1785	AAGGAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAACAUUG	5556
2474	CACAUAAG G UGGGAAAC	1786	GUUUCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUAUGUG	5557
2491	UUUACGGG G CUUUAUUC	1787	GAAUAAAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGUAAA	5558
2507	CUUCUACG G UACCUUGC	1788	GCAAGGUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUAGAAG	5559
2530	CCUAAAUG G CAAACUCC	1789	GGAGUUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUUUAGG	5560
2587	AGAUGUAA G CAAUUUGU	1790	ACAAAUUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUACAUCU	5561
2599	UUUGUGGG G CCCCUUAC	1791	GUAAGGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCACAAA	5562
2609	CCCUUACA G UAAAUGAA	1792	UUCAUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUAAGGG	5563
2650	CCUGCUAG G UUUUAUCC	1793	GGAUAAAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAGCAGG	5564
2701	AUCAAACC G UAUUAUCC	1794	GGAUAAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUUUGAU	5565
2713	UAUCCAGA G UAUGUAGU	1795	ACUACAUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUGGAUA	5566
2720	AGUAUGUA G UUAAUCAU	1796	AUGAUUAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACAUACU	5567
2768	UUUGGAAG G CGGGGAUC	1797	GAUCCCCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCCAAA	5568
2791	AAAAGAGA G UCCACACG	1798	CGUGUGGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUCUUUU	5569
2799	GUCCACAC G UAGCGCCU	1799	AGGCGCUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGUGGAC	5570
2802	CACACGUA G CGCCUCAU	1800	AUGAGGCG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACGUGUG	5571
2818	UUUUGCGG G UCACCAUA	1801	UAUGGUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCAAAA	5572
2848	GAUCUACA G CAUGGGAG	1802	CUCCCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUAGAUC	5573
2857	CAUGGGAG G UUGGUCUU	1803	AAGACCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCCAUG	5574
2861	GGAGGUUG G UCUUCCAA	1804	UUGGAAGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACCUCC	5575
2881	UCGAAAAG G CAUGGGGA	1805	UCCCCAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUUUCGA	5576
2936	GAUCAUCA G UUGGACCC	1806	GGGUCCAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAUGAUC	5577
2955	CAUUCAAA G CCAACUCA	1807	UGAGUUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUGAAUG	5578
2964	CCAACUCA G UAAAUCCA	1808	UGGAUUUA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGUUGG	5579
3005	GACAACUG G CCGGACGC	1809	GCGUCCGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGUUGUC	5580
3021	CCAACAAG G UGGGAGUG	1810	CACUCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGUUGG	5581
3027	AGGUGGGA G UGGGAGCA	1811	UGCUCCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCACCU	5582
3033	GAGUGGGA G CAUUCGGG	1812	CCCGAAUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCACUC	5583
3041	GCAUUCGG G CCAGGGUU	1813	AACCCUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGAAUGC	5584
3047	GGGCCAGG G UUCACCCC	1814	GGGGUGAA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGGCCC	5585
3077	CUGUUGGG G UGGAGCCC	1815	GGGCUCCA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAACAG	5586
3082	GGGGUGGA G CCCUCACG	1816	CGUGAGGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCACCCC	5587
3097	CGCUCAGG G CCUACUCA	1817	UGAGUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGAGCG	5588

Table 42

3117	CUGUGCCA G CAGCUCCU	1818	AGGAGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCACAG	5589
3120	UGCCAGCA G CUCCUCCU	1819	AGGAGGAG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUGGCA	5590
3146	ACCAAUCG G CAGUCAGG	1820	CCUGACUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGAUUGGU	5591
3149	AAUCGGCA G UCAGGAAG	1821	CUUCCUGA GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCGAUU	5592
3158	UCAGGAAG G CAGCCUAC	1822	GUAGGCUG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUCCUGA	5593
3161	GGAAGGCA G CCUACUCC	1823	GGAGUAGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCUUCC	5594
3204	AUCCUCAG G CCAUGCAG	1824	CUGCAUGG GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGAGGAU	5595
31	CUCUUCAA G AUCCCAGA	2196	UCUGGGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGAAGAG	5596
38	AGAUCCCA G AGUCAGGG	2197	CCCUGACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGGAUCU	5597
44	CAGAGUCA G GGCCCUGU	2198	ACAGGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGACUCUG	5598
45	AGAGUCAG G GCCCUGUA	2199	UACAGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGACUCU	5599
64	UUCCUGCU G GUGGCUCC	2200	GGAGCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCAGGAA	5600
67	CUGCUGGU G GCUCCAGU	2201	ACUGGAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCAGCAG	5601
79	CCAGUUCA G GAACAGUG	2202	CACUGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAACUGG	5602
80	CAGUUCAG G AACAGUGA	2203	UCACUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGAACUG	5603
99	CCUGCUCA G AAUACUGU	2204	ACAGUAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGCAGG	5604
135	UUAUCGAA G ACUGGGGA	2205	UCCCCAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCGAUAA	5605
139	CGAAGACU G GGGACCCU	2206	AGGGUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUCUUCG	5606
140	GAAGACUG G GGACCCUG	2207	CAGGGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGUCUUC	5607
141	AAGACUGG G GACCCUGU	2208	ACAGGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGUCUU	5608
142	AGACUGGG G ACCCUGUA	2209	UACAGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAGUCU	5609
159	CCGAACAU G GAGAACAU	2210	AUGUUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGUUCGG	5610
160	CGAACAUG G AGAACAUC	2211	GAUGUUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGUUCG	5611
162	AACAUGGA G AACAUCGC	2212	GCGAUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAUGUU	5612
175	UCGCAUCA G GACUCCUA	2213	UAGGAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAUGCGA	5613
176	CGCAUCAG G ACUCCUAG	2214	CUAGGAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGAUGCG	5614
184	GACUCCUA G GACCCCUG	2215	CAGGGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGGAGUC	5615
185	ACUCCUAG G ACCCCUGC	2216	GCAGGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAGGAGU	5616
204	GUGUUACA G GCGGGGUU	2217	AACCCCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUAACAC	5617
207	UUACAGGC G GGGUUUUU	2218	AAAAACCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCUGUAA	5618
208	UACAGGCG G GGUUUUUC	2219	GAAAAACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCCUGUA	5619
209	ACAGGCGG G GUUUUUCU	2220	AGAAAAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCCUGU	5620
246	AUACCACA G AGUCUAGA	2221	UCUAGACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGGUAU	5621
253	AGAGUCUA G ACUCGUGG	2222	CCACGAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGACUCU	5622

Table 42

260	AGACUCGU G GUGGACUU	2223	AAGUCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGAGUCU	5623
263	CUCGUGGU G GACUUCUC	2224	GAGAAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCACGAG	5624
264	UCGUGGUG G ACUUCUCU	2225	AGAGAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCACGA	5625
283	AUUUUCUA G GGGGAACA	2226	UGUUCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGAAAAU	5626
284	UUUUCUAG G GGGAACAC	2227	GUGUUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAGAAAA	5627
285	UUUCUAGG G GGAACACC	2228	GGUGUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUAGAAA	5628
286	UUCUAGGG G GAACACCC	2229	GGGUGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCUAGAA	5629
287	UCUAGGGG G AACACCCG	2230	CGGGUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCUAGA	5630
304	UGUGUCUU G GCCAAAAU	2231	AUUUUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGACACA	5631
367	UUUGUCCU G GUUAUCGC	2232	GCGAUAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGACAAA	5632
377	UUAUCGCU G GAUGUGUC	2233	GACACAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGCGAUAA	5633
378	UAUCGCUG G AUGUGUCU	2234	AGACACAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGCGAUA	5634
389	GUGUCUGC G GCGUUUUA	2235	UAAAACGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAGACAC	5635
441	UUCUUGUU G GUUCUUCU	2236	AGAAGAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAAGAA	5636
450	GUUCUUCU G GACUAUCA	2237	UGAUAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGAAGAAC	5637
451	UUCUUCUG G ACUAUCAA	2238	UUGAUAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGAAGAA	5638
460	ACUAUCAA G GUAUGUUG	2239	CAACAUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGAUAGU	5639
490	UAAUUCCA G GAUCAUCA	2240	UGAUGAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAAUUA	5640
491	AAUUCCAG G AUCAUCAA	2241	UUGAUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGAAUU	5641
511	CCAGCACC G GACCAUGC	2242	GCAUGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGUGCUGG	5642
512	CAGCACCG G ACCAUGCA	2243	UGCAUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGUGCUG	5643
544	CUGCUCAA G GAACCUCU	2244	AGAGGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGAGCAG	5644
545	UGCUCAAG G AACCUCUA	2245	UAGAGGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGAGCA	5645
585	AAACCUAC G GACGGAAA	2246	UUUCCGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAGGUUU	5646
586	AACCUACG G ACGGAAAC	2247	GUUUCCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUAGGUU	5647
589	CUACGGAC G GAAACUGC	2248	GCAGUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUCCGUAG	5648
590	UACGGACG G AAACUGCA	2249	UGCAGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUCCGUA	5649
623	AUCAUCUU G GGCUUUCG	2250	CGAAAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAUGAU	5650
624	UCAUCUUG G GCUUUCGC	2251	GCGAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGAUGA	5651
644	AUACCUAU G GGAGUGGG	2252	CCCACUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAGGUAU	5652
645	UACCUAUG G GAGUGGGC	2253	GCCCACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUAGGUA	5653
646	ACCUAUGG G AGUGGGCC	2254	GGCCCACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUAGGU	5654
650	AUGGGAGU G GGCCUCAG	2255	CUGAGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUCCCAU	5655
651	UGGGAGUG G GCCUCAGU	2256	ACUGAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUCCCA	5656

Table 42

671	UUUCUCUU G GCUCAGUU	2257	AACUGAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAGAAA	5657
701	UGUUCAGU G GUUCGUAG	2258	CUACGAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUGAACA	5658
709	GGUUCGUA G GGCUUUCC	2259	GGAAAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACGAACC	5659
710	GUUCGUAG G GCUUUCCC	2260	GGGAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUACGAAC	5660
728	CACUGUCU G GCUUUCAG	2261	CUGAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGACAGUG	5661
743	AGUUAUAU G GAUGAUGU	2262	ACAUCAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUAACU	5662
744	GUUAUAUG G AUGAUGUG	2263	CACAUCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUAUAAC	5663
752	GAUGAUGU G GUUUUGGG	2264	CCCAAAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUCAUC	5664
758	GUGGUUUU G GGGGCCAA	2265	UUGGCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAACCAC	5665
759	UGGUUUUG G GGGCCAAG	2266	CUUGGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAACCA	5666
760	GGUUUUGG G GGCCAAGU	2267	ACUUGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAAACC	5667
761	GUUUUGGG G GCCAAGUC	2268	GACUUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAAAAC	5668
824	UUGUCUUU G GGUAUACA	2269	UGUAUACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGACAA	5669
825	UGUCUUUG G GUAUACAU	2270	AUGUAUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAGACA	5670
856	AACAAAAA G AUGGGGAU	2271	AUCCCCAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUUGUU	5671
859	AAAAAGAU G GGGAUAUU	2272	AAUAUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUCUUUUU	5672
860	AAAAGAUG G GGAUAUUC	2273	GAAUAUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUCUUUU	5673
861	AAAGAUGG G GAUAUUCC	2274	GGAAUAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUCUUU	5674
862	AAGAUGGG G AUAUUCCC	2275	GGGAAUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAUCUU	5675
881	AACUUCAU G GGAUAUGU	2276	ACAUAUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGAAGUU	5676
882	ACUUCAUG G GAUAUGUA	2277	UACAUAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGAAGU	5677
883	CUUCAUGG G AUAUGUAA	2278	UUACAUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUGAAG	5678
894	AUGUAAUU G GGAGUUGG	2279	CCAACUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUUACAU	5679
895	UGUAAUUG G GAGUUGGG	2280	CCCAACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAUUACA	5680
896	GUAAUUGG G AGUUGGGG	2281	CCCCAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAUUAC	5681
901	UGGGAGUU G GGGCACAU	2282	AUGUGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACUCCCA	5682
902	GGGAGUUG G GGCACAUU	2283	AAUGUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACUCCC	5683
903	GGAGUUGG G GCACAUUG	2284	CAAUGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAACUCC	5684
917	UUGCCACA G GAACAUAU	2285	AUAUGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGGCAA	5685
918	UGCCACAG G AACAUAUU	2286	AAUAUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUGGCA	5686
952	GUGUUUUA G GAAACUUC	2287	GAAGUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAAACAC	5687
953	UGUUUUAG G AAACUUCC	2288	GGAAGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAAAACA	5688
970	UGUAAACA G GCCUAUUG	2289	CAAUAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUUACA	5689
982	UAUUGAUU G GAAAGUAU	2290	AUACUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUCAAUA	5690

Table 42

983	AUUGAUUG G AAAGUAUG	2291	CAUACUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAUCAAU	5691
1004	CGAAUUGU G GGUCUUUU	2292	AAAAGACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAUUCG	5692
1005	GAAUUGUG G GUCUUUUG	2293	CAAAAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAAUUC	5693
1013	GGUCUUUU G GGGUUUGC	2294	GCAAACCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAGACC	5694
1014	GUCUUUUG G GGUUUGCC	2295	GGCAAACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAAGAC	5695
1015	UCUUUUGG G GUUUGCCG	2296	CGGCAAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAAAGA	5696
1041	CGCAAUGU G GAUAUUCU	2297	AGAAUAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAUUGCG	5697
1042	GCAAUGUG G AUAUUCUG	2298	CAGAAUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAUUGC	5698
1088	GCAAAACA G GCUUUUAC	2299	GUAAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUUUGC	5699
1115	ACUUACAA G GCCUUUCU	2300	AGAAAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUAAGU	5700
1159	CGUUGCUC G GCAACGGC	2301	GCCGUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGCAACG	5701
1165	UCGGCAAC G GCCUGGUC	2302	GACCAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUUGCCGA	5702
1170	AACGGCCU G GUCUAUGC	2303	GCAUAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGCCGUU	5703
1206	CCCCCACU G GUUGGGGC	2304	GCCCCAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUGGGGG	5704
1210	CACUGGUU G GGGCUUGG	2305	CCAAGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACCAGUG	5705
1211	ACUGGUUG G GGCUUGGC	2306	GCCAAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACCAGU	5706
1212	CUGGUUGG G GCUUGGCC	2307	GGCCAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAACCAG	5707
1217	UGGGGCUU G GCCAUAGG	2308	CCUAUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGCCCCA	5708
1224	UGGCCAUA G GCCAUCAG	2309	CUGAUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAUGGCCA	5709
1242	GCAUGCGU G GAACCUUU	2310	AAAGGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACGCAUGC	5710
1243	CAUGCGUG G AACCUUUG	2311	CAAAGGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACGCAUG	5711
1277	CAUACCGC G GAACUCCU	2312	AGGAGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGGUAUG	5712
1278	AUACCGCG G AACUCCUA	2313	UAGGAGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCGGUAU	5713
1309	UCGCAGCA G GUCUGGGG	2314	CCCCAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCUGCGA	5714
1314	GCAGGUCU G GGGCAAAA	2315	UUUUGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGACCUGC	5715
1315	CAGGUCUG G GGCAAAAC	2316	GUUUUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGACCUG	5716
1316	AGGUCUGG G GCAAAACU	2317	AGUUUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGACCU	5717
1329	AACUCAUC G GGACUGAC	2318	GUCAGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUGAGUU	5718
1330	ACUCAUCG G GACUGACA	2319	UGUCAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGAUGAGU	5719
1331	CUCAUCGG G ACUGACAA	2320	UUGUCAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGAUGAG	5720
1378	AUUUCCAU G GCUGCUAG	2321	CUAGCAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGAAAU	5721
1386	GGCUGCUA G GCUGUGCU	2322	AGCACAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGCAGCC	5722
1402	UGCCAACU G GAUCCUAC	2323	GUAGGAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUGGCA	5723
1403	GCCAACUG G AUCCUACG	2324	CGUAGGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGUUGGC	5724

Table 42

1413	UCCUACGC G GGACGUCC	2325	GGACGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGUAGGA	5725
1414	CCUACGCG G GACGUCCU	2326	AGGACGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCGUAGG	5726
1415	CUACGCGG G ACGUCCUU	2327	AAGGACGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCGUAG	5727
1439	GUCCCGUC G GCGCUGAA	2328	UUCAGCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GACGGGAC	5728
1454	AAUCCCGC G GACGACCC	2329	GGGUCGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGGGAUU	5729
1455	AUCCCGCG G ACGACCCC	2330	GGGGUCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCGGGAU	5730
1468	CCCCUCCC G GGGCCGCU	2331	AGCGGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGGAGGGG	5731
1469	CCCUCCCG G GGCCGCUU	2332	AAGCGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGGAGGG	5732
1470	CCUCCCGG G GCCGCUUG	2333	CAAGCGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGGGAGG	5733
1478	GGCCGCUU G GGGCUCUA	2334	UAGAGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGCGGCC	5734
1479	GCCGCUUG G GGCUCUAC	2335	GUAGAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGCGGC	5735
1480	CCGCUUGG G GCUCUACC	2336	GGUAGAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAGCGG	5736
1523	CCGUCCAC G GGGCGCAC	2337	GUGCGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUGGACGG	5737
1524	CGUCCACG G GGCGCACC	2338	GGUGCGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUGGACG	5738
1525	GUCCACGG G GCGCACCU	2339	AGGUGCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGUGGAC	5739
1544	CUUUACGC G GACUCCCC	2340	GGGGAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCGUAAAG	5740
1545	UUUACGCG G ACUCCCCG	2341	CGGGGAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCGUAAA	5741
1574	CAUCUGCC G GACCGUGU	2342	ACACGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCAGAUG	5742
1575	AUCUGCCG G ACCGUGUG	2343	CACACGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGCAGAU	5743
1612	CGUCGCAU G GAGACCAC	2344	GUGGUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCGACG	5744
1613	GUCGCAUG G AGACCACC	2345	GGUGGUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGCGAC	5745
1615	CGCAUGGA G ACCACCGU	2346	ACGGUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCAUGCG	5746
1635	CGCCCACA G GAACCUGC	2347	GCAGGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUGGGCG	5747
1636	GCCCACAG G AACCUGCC	2348	GGCAGGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUGGGC	5748
1648	CUGCCCAA G GUCUUGCA	2349	UGCAAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGGGCAG	5749
1660	UUGCAUAA G AGGACUCU	2350	AGAGUCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAUGCAA	5750
1662	GCAUAAGA G GACUCUUG	2351	CAAGAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUAUGC	5751
1663	CAUAAGAG G ACUCUUGG	2352	CCAAGAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCUUAUG	5752
1670	GGACUCUU G GACUUUCA	2353	UGAAAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAGUCC	5753
1671	GACUCUUG G ACUUUCAG	2354	CUGAAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGAGUC	5754
1702	GACCUUGA G GCAUACUU	2355	AAGUAUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCAAGGUC	5755
1715	ACUUCAAA G ACUGUGUG	2356	CACACAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUGAAGU	5756
1734	UAAUGAGU G GGAGGAGU	2357	ACUCCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUCAUUA	5757
1735	AAUGAGUG G GAGGAGUU	2358	AACUCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUCAUU	5758

Table 42

1736	AUGAGUGG G AGGAGUUG	2359	CAACUCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACUCAU	5759
1738	GAGUGGGA G GAGUUGGG	2360	CCCAACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCACUC	5760
1739	AGUGGGAG G AGUUGGGG	2361	CCCCAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCCACU	5761
1744	GAGGAGUU G GGGGAGGA	2362	UCCUCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACUCCUC	5762
1745	AGGAGUUG G GGGAGGAG	2363	CUCCUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACUCCU	5763
1746	GGAGUUGG G GGAGGAGG	2364	CCUCCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAACUCC	5764
1747	GAGUUGGG G GAGGAGGU	2365	ACCUCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAACUC	5765
1748	AGUUGGGG G AGGAGGUU	2366	AACCUCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCAACU	5766
1750	UUGGGGGA G GAGGUUAG	2367	CUAACCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCCCAA	5767
1751	UGGGGGAG G AGGUUAGG	2368	CCUAACCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCCCCA	5768
1753	GGGGAGGA G GUUAGGUU	2369	AACCUAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUCCCC	5769
1758	GGAGGUUA G GUUAAAGG	2370	CCUUUAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAACCUCC	5770
1765	AGGUUAAA G GUCUUUGU	2371	ACAAAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUAACCU	5771
1778	UUGUACUA G GAGGCUGU	2372	ACAGCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGUACAA	5772
1779	UGUACUAG G AGGCUGUA	2373	UACAGCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUAGUACA	5773
1781	UACUAGGA G GCUGUAGG	2374	CCUACAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUAGUA	5774
1788	AGGCUGUA G GCAUAAAU	2375	AUUUAUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UACAGCCU	5775
1798	CAUAAAUU G GUGUGUUC	2376	GAACACAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUUUAUG	5776
1888	UGUGCCUU G GGUGGCUU	2377	AAGCCACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGCACA	5777
1889	GUGCCUUG G GUGGCUUU	2378	AAAGCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGGCAC	5778
1892	CCUUGGGU G GCUUUGGG	2379	CCCAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCAAGG	5779
1898	GUGGCUUU G GGGCAUGG	2380	CCAUGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGCCAC	5780
1899	UGGCUUUG G GGCAUGGA	2381	UCCAUGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAGCCA	5781
1900	GGCUUUGG G GCAUGGAC	2382	GUCCAUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAAGCC	5782
1905	UGGGGCAU G GACAUUGA	2383	UCAAUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCCCCA	5783
1906	GGGGCAUG G ACAUUGAC	2384	GUCAAUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGCCCC	5784
1924	CGUAUAAA G AAUUUGGA	2385	UCCAAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUAUACG	5785
1930	AAGAAUUU G GAGCUUCU	2386	AGAAGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUUCUU	5786
1931	AGAAUUUG G AGCUUCUG	2387	CAGAAGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAUUCU	5787
1941	GCUUCUGU G GAGUUACU	2388	AGUAACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAGAAGC	5788
1942	CUUCUGUG G AGUUACUC	2389	GAGUAACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAGAAG	5789
1987	CUAUUCGA G AUCUCCUC	2390	GAGGAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCGAAUAG	5790
2018	UCUGUAUC G GGGGGCCU	2391	AGGCCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUACAGA	5791
2019	CUGUAUCG G GGGGCCUU	2392	AAGGCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGAUACAG	5792

Table 42

2020	UGUAUCGG G GGGCCUUA	2393	UAAGGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGAUACA	5793
2021	GUAUCGGG G GGCCUUAG	2394	CUAAGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGAUAC	5794
2022	UAUCGGGG G GCCUUAGA	2395	UCUAAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCGAUA	5795
2029	GGGCCUUA G AGUCUCCG	2396	CGGAGACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAGGCCC	5796
2037	GAGUCUCC G GAACAUUG	2397	CAAUGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAGACUC	5797
2038	AGUCUCCG G AACAUUGU	2398	ACAAUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGAGACU	5798
2061	CACCAUAC G GCACUCAG	2399	CUGAGUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAUGGUG	5799
2069	GGCACUCA G GCAAGCUA	2400	UAGCUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGUGCC	5800
2087	UCUGUGUU G GGGUGAGU	2401	ACUCACCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACACAGA	5801
2088	CUGUGUUG G GGUGAGUU	2402	AACUCACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACACAG	5802
2089	UGUGUUGG G GUGAGUUG	2403	CAACUCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAACACA	5803
2114	AGCCACCU G GGUGGGAA	2404	UUCCCACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGUGGCU	5804
2115	GCCACCUG G GUGGGAAG	2405	CUUCCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGUGGC	5805
2118	ACCUGGGU G GGAAGUAA	2406	UUACUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCAGGU	5806
2119	CCUGGGUG G GAAGUAAU	2407	AUUACUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCCAGG	5807
2120	CUGGGUGG G AAGUAAUU	2408	AAUUACUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACCCAG	5808
2130	AGUAAUUU G GAAGAUCC	2409	GGAUCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUUACU	5809
2131	GUAAUUUG G AAGAUCCA	2410	UGGAUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAUUAC	5810
2134	AUUUGGAA G AUCCAGCA	2411	UGCUGGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCAAAU	5811
2147	AGCAUCCA G GGAAUUAG	2412	CUAAUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAUGCU	5812
2148	GCAUCCAG G GAAUUAGU	2413	ACUAAUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGAUGC	5813
2149	CAUCCAGG G AAUUAGUA	2414	UACUAAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUGGAUG	5814
2181	GUUAAUAU G GGCCUAAA	2415	UUUAGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUAUUAAC	5815
2182	UUAAUAUG G GCCUAAAA	2416	UUUUAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUAUUAA	5816
2195	AAAAAUCA G ACAACUAU	2417	AUAGUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAUUUUU	5817
2207	ACUAUUGU G GUUUCACA	2418	UGUGAAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAUAGU	5818
2233	UUACUUUU G GGCGAGAA	2419	UUCUCGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAGUAA	5819
2234	UACUUUUG G GCGAGAAA	2420	UUUCUCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAAGUA	5820
2239	UUGGGCGA G AAACUGUU	2421	AACAGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCGCCCAA	5821
2259	GAAUAUUU G GUGUCUUU	2422	AAAGACAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAUAUUC	5822
2269	UGUCUUUU G GAGUGUGG	2423	CCACACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAAGACA	5823
2270	GUCUUUUG G AGUGUGGA	2424	UCCACACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAAGAC	5824
2276	UGGAGUGU G GAUUCGCA	2425	UGCGAAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACACUCCA	5825
2277	GGAGUGUG G AUUCGCAC	2426	GUGCGAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACACUCC	5826

Table 42

2300	UGCAUAUA G ACCACCAA	2427	UUGGUGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAUAUGCA	5827
2334	ACACUUCC G GAAACUAC	2428	GUAGUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGAAGUGU	5828
2335	CACUUCCG G AAACUACU	2429	AGUAGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGAAGUG	5829
2351	UGUUGUUA G ACGAAGAG	2430	CUCUUCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAACAACA	5830
2357	UAGACGAA G AGGCAGGU	2431	ACCUGCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCGUCUA	5831
2359	GACGAAGA G GCAGGUCC	2432	GGACCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUCGUC	5832
2363	AAGAGGCA G GUCCCCUA	2433	UAGGGGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCCUCUU	5833
2372	GUCCCCUA G AAGAAGAA	2434	UUCUUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGGGGAC	5834
2375	CCCUAGAA G AAGAACUC	2435	GAGUUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUAGGG	5835
2378	UAGAAGAA G AACUCCCU	2436	AGGGAGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUUCUA	5836
2396	GCCUCGCA G ACGAAGGU	2437	ACCUUCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGAGGC	5837
2402	CAGACGAA G GUCUCAAU	2438	AUUGAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCGUCUG	5838
2423	GCGUCGCA G AAGAUCUC	2439	GAGAUCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCGACGC	5839
2426	UCGCAGAA G AUCUCAAU	2440	AUUGAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCUGCGA	5840
2438	UCAAUCUC G GGAAUCUC	2441	GAGAUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAGAUUGA	5841
2439	CAAUCUCG G GAAUCUCA	2442	UGAGAUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGAGAUUG	5842
2440	AAUCUCGG G AAUCUCAA	2443	UUGAGAUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGAGAUU	5843
2463	UAUUCCUU G GACACAUA	2444	UAUGUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGGAAUA	5844
2464	AUUCCUUG G ACACAUAA	2445	UUAUGUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGGAAU	5845
2473	ACACAUAA G GUGGGAAA	2446	UUUCCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAUGUGU	5846
2476	CAUAAGGU G GGAAACUU	2447	AAGUUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCUUAUG	5847
2477	AUAAGGUG G GAAACUUU	2448	AAAGUUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCUUAU	5848
2478	UAAGGUGG G AAACUUUA	2449	UAAAGUUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACCUUA	5849
2488	AACUUUAC G GGCUUUA	2450	UAAAGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAAAGUU	5850
2489	ACUUUACG G GGCUUUAU	2451	AUAAAGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGUAAAGU	5851
2490	CUUUACGG G GCUUUAUU	2452	AAUAAAGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGUAAAG	5852
2506	UCUUCUAC G GUACCUUG	2453	CAAGGUAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GUAGAAGA	5853
2529	UCCUAAAU G GCAAACUC	2454	GAGUUUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUUUAGGA	5854
2563	CAUUUGCA G GAGGACAU	2455	AUGUCCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGCAAAUG	5855
2564	AUUUGCAG G AGGACAUU	2456	AAUGUCCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGCAAAU	5856
2566	UUGCAGGA G GACAUUGU	2457	ACAAUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUGCAA	5857
2567	UGCAGGAG G ACAUUGUU	2458	AACAAUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUCCUGCA	5858
2580	UGUUGAUA G AUGUAAGC	2459	GCUUACAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAUCAACA	5859
2596	CAAUUUGU G GGGCCCCU	2460	AGGGGCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACAAAUUG	5860

Table 42

2597	AAUUUGUG G GGCCCCUU	2461	AAGGGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACAAAUU	5861
2598	AUUUGUGG G GCCCCUUA	2462	UAAGGGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACAAAU	5862
2622	UGAAAACA G GAGACUUA	2463	UAAGUCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGUUUUCA	5863
2623	GAAAACAG G AGACUUAA	2464	UUAAGUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGUUUUC	5864
2625	AAACAGGA G ACUUAAAU	2465	AUUUAAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCUGUUU	5865
2649	GCCUGCUA G GUUUUAUC	2466	GAUAAAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAGCAGGC	5866
2684	UGCCCUUA G AUAAAGGG	2467	CCCUUUAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UAAGGGCA	5867
2690	UAGAUAAA G GGAUCAAA	2468	UUUGAUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUAUCUA	5868
2691	AGAUAAAG G GAUCAAAC	2469	GUUUGAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUUAUCU	5869
2692	GAUAAAGG G AUCAAACC	2470	GGUUUGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUUUAUC	5870
2711	AUUAUCCA G AGUAUGUA	2471	UACAUACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAUAAU	5871
2737	UACUUCCA G ACGCGACA	2472	UGUCGCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAAGUA	5872
2763	CACUCUUU G GAAGGCGG	2473	CCGCCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAAGAGUG	5873
2764	ACUCUUUG G AAGGCGGG	2474	CCCGCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAAGAGU	5874
2767	CUUUGGAA G GCGGGGAU	2475	AUCCCCGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCAAAG	5875
2770	UGGAAGGC G GGGAUCUU	2476	AAGAUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCCUUCCA	5876
2771	GGAAGGCG G GGAUCUUA	2477	UAAGAUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCCUUCC	5877
2772	GAAGGCGG G GAUCUUAU	2478	AUAAGAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCGCCUUC	5878
2773	AAGGCGGG G AUCUUAUA	2479	UAUAAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCGCCUU	5879
2787	AUAUAAAA G AGAGUCCA	2480	UGGACUCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUAUAU	5880
2789	AUAAAAGA G AGUCCACA	2481	UGUGGACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCUUUUAU	5881
2816	CAUUUUGC G GGUCACCA	2482	UGGUGACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GCAAAAUG	5882
2817	AUUUUGCG G GUCACCAU	2483	AUGGUGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGCAAAAU	5883
2832	AUAUUCUU G GGAACAAG	2484	CUUGUUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAGAAUAU	5884
2833	UAUUCUUG G GAACAAGA	2485	UCUUGUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAGAAUA	5885
2834	AUUCUUGG G AACAAGAU	2486	AUCUUGUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAGAAU	5886
2840	GGGAACAA G AUCUACAG	2487	CUGUAGAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUUCCC	5887
2852	UACAGCAU G GGAGGUUG	2488	CAACCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCUGUA	5888
2853	ACAGCAUG G GAGGUUGG	2489	CCAACCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGCUGU	5889
2854	CAGCAUGG G AGGUUGGU	2490	ACCAACCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUGCUG	5890
2856	GCAUGGGA G GUUGGUCU	2491	AGACCAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UCCCAUGC	5891
2860	GGGAGGUU G GUCUUCCA	2492	UGGAAGAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACCUCCC	5892
2880	CUCGAAAA G GCAUGGGG	2493	CCCCAUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUUUCGAG	5893
2885	AAAGGCAU G GGGACAAA	2494	UUUGUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGCCUUU	5894

Table 42

2886	AAGGCAUG G GGACAAAU	2495	AUUUGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGCCUU	5895
2887	AGGCAUGG G GACAAAUC	2496	GAUUUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUGCCU	5896
2888	GGCAUGGG G ACAAAUCU	2497	AGAUUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAUGCC	5897
2915	AAUCCCCU G GGAUUCUU	2498	AAGAAUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGGGGAUU	5898
2916	AUCCCCUG G GAUUCUUC	2499	GAAGAAUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAGGGGAU	5899
2917	UCCCCUGG G AUUCUUCC	2500	GGAAGAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAGGGGA	5900
2939	CAUCAGUU G GACCCUGC	2501	GCAGGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACUGAUG	5901
2940	AUCAGUUG G ACCCUGCA	2502	UGCAGGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACUGAU	5902
2973	UAAAUCCA G AUUGGGAC	2503	GUCCCAAU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGAUUUA	5903
2977	UCCAGAUU G GGACCUCA	2504	UGAGGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AAUCUGGA	5904
2978	CCAGAUUG G GACCUCAA	2505	UUGAGGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAAUCUGG	5905
2979	CAGAUUGG G ACCUCAAC	2506	GUUGAGGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAAUCUG	5906
2996	CCGCACAA G GACAACUG	2507	CAGUUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUGCGG	5907
2997	CGCACAAG G ACAACUGG	2508	CCAGUUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUGUGCG	5908
3004	GGACAACU G GCCGGACG	2509	CGUCCGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AGUUGUCC	5909
3008	AACUGGCC G GACGCCAA	2510	UUGGCGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GGCCAGUU	5910
3009	ACUGGCCG G ACGCCAAC	2511	GUUGGCGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGGCCAGU	5911
3020	GCCAACAA G GUGGGAGU	2512	ACUCCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUGUUGGC	5912
3023	AACAAGGU G GGAGUGGG	2513	CCCACUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCUUGUU	5913
3024	ACAAGGUG G GAGUGGGA	2514	UCCCACUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCUUGU	5914
3025	CAAGGUGG G AGUGGGAG	2515	CUCCCACU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACCUUG	5915
3029	GUGGGAGU G GGAGCAUU	2516	AAUGCUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACUCCCAC	5916
3030	UGGGAGUG G GAGCAUUC	2517	GAAUGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACUCCCA	5917
3031	GGGAGUGG G AGCAUUCG	2518	CGAAUGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCACUCCC	5918
3039	GAGCAUUC G GGCCAGGG	2519	CCCUGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAAUGCUC	5919
3040	AGCAUUCG G GCCAGGGU	2520	ACCCUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CGAAUGCU	5920
3045	UCGGGCCA G GGUUCACC	2521	GGUGAACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGGCCCGA	5921
3046	CGGGCCAG G GUUCACCC	2522	GGGUGAAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGGCCCG	5922
3063	CUCCCCAU G GGGGACUG	2523	CAGUCCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AUGGGGAG	5923
3064	UCCCCAUG G GGGACUGU	2524	ACAGUCCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAUGGGGA	5924
3065	CCCCAUGG G GGACUGUU	2525	AACAGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAUGGGG	5925
3066	CCCAUGGG G GACUGUUG	2526	CAACAGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCAUGGG	5926
3067	CCAUGGGG G ACUGUUGG	2527	CCAACAGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCCCAUGG	5927
3074	GGACUGUU G GGGUGGAG	2528	CUCCACCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG AACAGUCC	5928

Table 42

3075	GACUGUUG G GGUGGAGC	2529	GCUCCACC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CAACAGUC	5929
3076	ACUGUUGG G GUGGAGCC	2530	GGCUCCAC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCAACAGU	5930
3079	GUUGGGGU G GAGCCCUC	2531	GAGGGCUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG ACCCCAAC	5931
3080	UUGGGGUG G AGCCCUCA	2532	UGAGGGCU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CACCCCAA	5932
3095	CACGCUCA G GGCCUACU	2533	AGUAGGCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGCGUG	5933
3096	ACGCUCAG G GCCUACUC	2534	GAGUAGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGAGCGU	5934
3145	CACCAAUC G GCAGUCAG	2535	CUGACUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG GAUUGGUG	5935
3153	GGCAGUCA G GAAGGCAG	2536	CUGCCUUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGACUGCC	5936
3154	GCAGUCAG G AAGGCAGC	2537	GCUGCCUU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUGACUGC	5937
3157	GUCAGGAA G GCAGCCUA	2538	UAGGCUGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUCCUGAC	5938
3187	ACCUCUAA G GGACACUC	2539	GAGUGUCC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UUAGAGGU	5939
3188	CCUCUAAG G GACACUCA	2540	UGAGUGUC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CUUAGAGG	5940
3189	CUCUAAGG G ACACUCAU	2541	AUGAGUGU GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG CCUUAGAG	5941
3203	CAUCCUCA G GCCAUGCA	2542	UGCAUGGC GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG UGAGGAUG	5942

Input Sequence = AF100308. Cut Site = YG/M or UG/U.
Stem Length = 8. Core Sequence = GGAGGAAACUCC CU UCAAGGACAUCGUCCGGG
AF100308 (Hepatitis B virus strain 2-18, 3215 bp)

Table 43

Table 43: Human HBV Ribozyme and Target Sequence

Pos	Substrate	Seq ID	RPI#	Ribozyme Alias	Ribozyme	Rz Seq ID
313	CCAAAAU U CGCAGUC	5943	18157	HBV-313 Rz-7 RNA	GACUGCG CUGAUGAGGCCGUUAGGCCGAA AUUUUGG **B**	6293
327	CCCAAAU C UCCAGUC	5944	18158	HBV-327 Rz-7 RNA	GACUGGA CUGAUGAGGCCGUUAGGCCGAA AUUUGGG **B**	6294
334	CUCCAGU C ACUCACC	5945	18159	HBV-334 Rz-7 RNA	GGUGAGU CUGAUGAGGCCGUUAGGCCGAA ACUGGAG **B**	6295
408	UCUUCCU C UGCAUCC	5946	18160	HBV-408 Rz-7 RNA	GGAUGCA CUGAUGAGGCCGUUAGGCCGAA AGGAAGA **B**	6296
557	UCUAUGU U UCCCUCA	5947	18161	HBV-557 Rz-7 RNA	UGAGGGA CUGAUGAGGCCGUUAGGCCGAA ACAUAGA **B**	6297
1255	UUUGUGU C UCCUCUG	5948	18162	HBV-1255 Rz-7 RNA	CAGAGGA CUGAUGAGGCCGUUAGGCCGAA ACACAAA **B**	6298
1538	CCUCUCU U UACGCGG	5949	18163	HBV-1538 Rz-7 RNA	CCGCGUA CUGAUGAGGCCGUUAGGCCGAA AGAGAGG **B**	6299
1756	AGGAGGU U AGGUUAA	5950	18164	HBV-1756 Rz-7 RNA	UUAACCU CUGAUGAGGCCGUUAGGCCGAA ACCUCCU **B**	6300
1861	AUGUCCU A CUGUUCA	5951	18165	HBV-1861 Rz-7 RNA	UGAACAG CUGAUGAGGCCGUUAGGCCGAA AGGACAU **B**	6301
2504	UUCUUCU A CGGUACC	5952	18166	HBV-2504 Rz-7 RNA	GGUACCG CUGAUGAGGCCGUUAGGCCGAA AGAAGAA **B**	6302
10	CUCCACC A CUUUCCA	5953	18197	HBV-10 CHz-7 RNA	UGGAAAG CUGAUGAGGCCGUUAGGCCGAA GGUGGAG **B**	6303
335	UCCAGUC A CUCACCA	5954	18198	HBV-335 CHz-7 RNA	UGGUGAG CUGAUGAGGCCGUUAGGCCGAA GACUGGA **B**	6304
1258	GUGUCUC C UCUGCCG	5955	18199	HBV-1258 CHz-7 RNA	CGGCAGA CUGAUGAGGCCGUUAGGCCGAA GAGACAC **B**	6305
2307	GACCACC A AAUGCCC	5956	18200	HBV-2307 CHz-7 RNA	GGGCAUU CUGAUGAGGCCGUUAGGCCGAA GGUGGUC **B**	6306
347	UCACCAACCU G UUGUC	5957	18216	HBV-347 GCI.Rz-5/10 RNA	GACAA UGAUGGCAUGCACUAUGCGCG AGGUUGGUGA **B**	6307
350	CCAACCUGUU G UCCUC	5958	18217	HBV-350 GCI.Rz-5/10 RNA	GAGGA UGAUGGCAUGCACUAUGCGCG AACAGGUUGG **B**	6308
1508	UCCGCCUAUU G UACCG	5959	18218	HBV-1508 GCI.Rz-5/10 RNA	CGGUA UGAUGGCAUGCACUAUGCGCG AAUAGGCGGA **B**	6309
234	AAUCCU C ACAAUA	5960	18334	HBV-234 Rz-6 allyl stab1	$u_{s}a_{s}u_{s}u_{s}$gu cUGAuGaggccguuaggccGaa Aggauu **B**	6310
252	GAGUCU A GACUCG	5961	18335	HBV-252 Rz-6 allyl stab1	$c_{s}g_{s}a_{s}g_{s}$uc cUGAuGaggccguuaggccGaa Agacuc **B**	6311
268	UGGACU U CUCUCA	5962	18337	HBV-268 Rz-6 allyl stab1	$u_{s}g_{s}a_{s}g_{s}$ag cUGAuGaggccguuaggccGaa Agucca **B**	6312
280	AAUUUU C UAGGGG	5963	18345	HBV-280 Rz-6 allyl stab1	$c_{s}c_{s}c_{s}c_{s}$ua cUGAuGaggccguuaggccGaa Aaaauu **B**	6313
313	CAAAAU U CGCAGU	5964	18346	HBV-313 Rz-6 allyl stab1	$a_{s}c_{s}u_{s}g_{s}$cg cUGAuGaggccguuaggccGaa Auuuug **B**	6314
395	GGCGUU U UAUCAU	5965	18350	HBV-395 Rz-6 allyl stab1	$a_{s}u_{s}g_{s}a_{s}$ua cUGAuGaggccguuaggccGaa Aacgcc **B**	6315
402	UAUCAU C UUCCUC	5966	18351	HBV-402 Rz-6 allyl stab1	$g_{s}a_{s}g_{s}g_{s}$aa cUGAuGaggccguuaggccGaa Augaua **B**	6316
607	UGUAUU C CCAUCC	5967	18355	HBV-607 Rz-6 allyl stab1	$g_{s}g_{s}a_{s}u_{s}$gg cUGAuGaggccguuaggccGaa Aauaca **B**	6317
697	UUUGUU C AGUGGU	5968	18362	HBV-697 Rz-6 allyl stab1	$a_{s}c_{s}c_{s}a_{s}$cu cUGAuGaggccguuaggccGaa Aacaaa **B**	6318
1539	UCUCUU U ACGCGG	5969	18366	HBV-1539 Rz-6 allyl stab1	$c_{s}c_{s}g_{s}c_{s}$gu cUGAuGaggccguuaggccGaa Aagaga **B**	6319
1599	UCACCU C UGCACG	5970	18367	HBV-1599 Rz-6 allyl stab1	$c_{s}g_{s}u_{s}g_{s}$ca cUGAuGaggccguuaggccGaa Agguga **B**	6320
1607	GCACGU C GCAUGG	5971	18368	HBV-1607 Rz-6 allyl stab1	$c_{s}c_{s}a_{s}u_{s}$gc cUGAuGaggccguuaggccGaa Acgugc **B**	6321

Table 43

1833	UCACCU C UGCCUA	5972	18371	HBV-1833 Rz-6 allyl stab1	$u_s a_s g_s g_s$ca cUGAuGaggccguuaggccGaa Agguga **B**	6322
2383	AGAACU C CCUCGC	5973	18374	HBV-2383 Rz-6 allyl stab1	$g_s c_s g_s a_s$gg cUGAuGaggccguuaggccGaa Aguucu **B**	6323
2429	GAAGAU C UCAAUC	5974	18376	HBV-2429 Rz-6 allyl stab1	$g_s a_s u_s u_s$ga cUGAuGaggccguuaggccGaa Aucuuc **B**	6324
2831	UAUUCU U GGGAAC	5975	18379	HBV-2831 Rz-6 allyl stab1	$g_s u_s u_s c_s$cc cUGAuGaggccguuaggccGaa Agaaua **B**	6325
430	UGCCUC A UCUUCU	5976	18391	HBV-430 CHz-6 allyl stab1	$a_s g_s a_s a_s$ga cUGAuGaggccguuaggccGaa Iaggca **B**	6326
676	UGGCUC A GUUUAC	5977	18396	HBV-676 CHz-6 allyl stab1	$g_s u_s a_s a_s$ac cUGAuGaggccguuaggccGaa Iagcca **B**	6327
683	GUUUAC U AGUGCC	5978	18397	HBV-683 CHz-6 allyl stab1	$g_s g_s c_s a_s$cu cUGAuGaggccguuaggccGaa Iuaaac **B**	6328
1150	UUUACC C CGUUGC	5979	18402	HBV-1150 CHz-6 allyl stab1	$g_s c_s a_s a_s$cg cUGAuGaggccguuaggccGaa Iguaaa **B**	6329
1200	GCAACC C CCACUG	5980	18403	HBV-1200 CHz-6 allyl stab1	$c_s a_s g_s u_s$gg cUGAuGaggccguuaggccGaa Iguugc **B**	6330
1201	CAACCC C CACUGG	5981	18404	HBV-1201 CHz-6 allyl stab1	$c_s c_s a_s g_s$ug cUGAuGaggccguuaggccGaa Igguug **B**	6331
1444	CGGCGC U GAAUCC	5982	18405	HBV-1444 CHz-6 allyl stab1	$g_s g_s a_s u_s$uc cUGAuGaggccguuaggccGaa Icgccg **B**	6332
1451	GAAUCC C GCGGAC	5983	18406	HBV-1451 CHz-6 allyl stab1	$g_s u_s c_s c_s$gc cUGAuGaggccguuaggccGaa Igauuc **B**	6333
1533	CGCACC U CUCUUU	5984	18407	HBV-1533 CHz-6 allyl stab1	$a_s a_s a_s g_s$ag cUGAuGaggccguuaggccGaa Igugcg **B**	6334
1600	CACCUC U GCACGU	5985	18410	HBV-1600 CHz-6 allyl stab1	$a_s c_s g_s u_s$gc cUGAuGaggccguuaggccGaa Iaggug **B**	6335
1698	CCGACC U UGAGGC	5986	18411	HBV-1698 CHz-6 allyl stab1	$g_s c_s c_s u_s$ca cUGAuGaggccguuaggccGaa Igucgg **B**	6336
1784	GGAGGC U GUAGGC	5987	18412	HBV-1784 CHz-6 allyl stab1	$g_s c_s c_s u_s$ac cUGAuGaggccguuaggccGaa Iccucc **B**	6337
1829	UUUUUC A CCUCUG	5988	18414	HBV-1829 CHz-6 allyl stab1	$c_s a_s g_s a_s$gg cUGAuGaggccguuaggccGaa Iaaaaa **B**	6338
1876	GCCUCC A AGCUGU	5989	18420	HBV-1876 CHz-6 allyl stab1	$a_s c_s a_s g_s$cu cUGAuGaggccguuaggccGaa Igaggc **B**	6339
1880	CCAAGC U GUGCCU	5990	18422	HBV-1880 CHz-6 allyl stab1	$a_s g_s g_s c_s$ac cUGAuGaggccguuaggccGaa Icuugg **B**	6340
218	UUUUUCU U GUUGACA	5991	18333	HBV-218 Rz-7 allyl stab1	$u_s g_s u_s c_s$aac cUGAuGaggccguuaggccGaa Agaaaaa **B**	6341
257	CUAGACU C GUGGUGG	5992	18336	HBV-257 Rz-7 allyl stab1	$c_s c_s a_s c_s$cac cUGAuGaggccguuaggccGaa Agucuag **B**	6342
268	GUGGACU U CUCUCAA	5993	18338	HBV-268 Rz-7 allyl stab1	$u_s u_s g_s a_s$gag cUGAuGaggccguuaggccGaa Aguccac **B**	6343
269	UGGACUU C UCUCAAU	5994	18339	HBV-269 Rz-7 allyl stab1	$a_s u_s u_s g_s$aga cUGAuGaggccguuaggccGaa Aagucca **B**	6344
271	GACUUCU C UCAAUUU	5995	18340	HBV-271 Rz-7 allyl stab1	$a_s a_s a_s u_s$uga cUGAuGaggccguuaggccGaa Agaaguc **B**	6345
273	CUUCUCU C AAUUUUC	5996	18341	HBV-273 Rz-7 allyl stab1	$g_s a_s a_s a_s$auu cUGAuGaggccguuaggccGaa Agagaag **B**	6346
277	UCUCAAU U UUCUAGG	5997	18342	HBV-277 Rz-7 allyl stab1	$c_s c_s u_s a_s$gaa cUGAuGaggccguuaggccGaa Auugaga **B**	6347
278	CUCAAUU U UCUAGGG	5998	18343	HBV-278 Rz-7 allyl stab1	$c_s c_s c_s u_s$aga cUGAuGaggccguuaggccGaa Aauugag **B**	6348
279	UCAAUUU U CUAGGGG	5999	18344	HBV-279 Rz-7 allyl stab1	$c_s c_s c_s c_s$uag cUGAuGaggccguuaggccGaa Aaauuga **B**	6349
314	CAAAAUU C GCAGUCC	6000	18347	HBV-314 Rz-7 allyl stab1	$g_s g_s a_s c_s$ugc cUGAuGaggccguuaggccGaa Aauuuug **B**	6350
385	GAUGUGU C UGCGGCG	6001	18348	HBV-385 Rz-7 allyl stab1	$c_s g_s c_s c_s$gca cUGAuGaggccguuaggccGaa Acacauc **B**	6351
394	GCGGCGU U UUAUCAU	6002	18349	HBV-394 Rz-7 allyl stab1	$a_s u_s g_s a_s$uaa cUGAuGaggccguuaggccGaa Acgccgc **B**	6352

Table 43

402	UUAUCAU C UUCCUCU	6003	18352	HBV-402 Rz-7 allyl stab1	$a_sg_sa_sg_s$gaa cUGAuGaggccguuaggccGaa Augauaa **B**	6353
423	UGCUGCU A UGCCUCA	6004	18353	HBV-423 Rz-7 allyl stab1	$u_sg_sa_sg_s$gca cUGAuGaggccguuaggccGaa Agcagca **B**	6354
429	UAUGCCU C AUCUUCU	6005	18354	HBV-429 Rz-7 allyl stab1	$a_sg_sa_sa_s$gau cUGAuGaggccguuaggccGaa Aggcaua **B**	6355
679	GCUCAGU U UACUAGU	6006	18356	HBV-679 Rz-7 allyl stab1	$a_sc_su_sa_s$gua cUGAuGaggccguuaggccGaa Acugagc **B**	6356
680	CUCAGUU U ACUAGUG	6007	18357	HBV-680 Rz-7 allyl stab1	$c_sa_sc_su_s$agu cUGAuGaggccguuaggccGaa Aacugag **B**	6357
681	UCAGUUU A CUAGUGC	6008	18358	HBV-681 Rz-7 allyl stab1	$g_sc_sa_sc_s$uag cUGAuGaggccguuaggccGaa Aaacuga **B**	6358
684	GUUUACU A GUGCCAU	6009	18359	HBV-684 Rz-7 allyl stab1	$a_su_sg_sg_s$cac cUGAuGaggccguuaggccGaa Aguaaac **B**	6359
692	GUGCCAU U UGUUCAG	6010	18360	HBV-692 Rz-7 allyl stab1	$c_su_sg_sa_s$aca cUGAuGaggccguuaggccGaa Auggcac **B**	6360
693	UGCCAUU U GUUCAGU	6011	18361	HBV-693 Rz-7 allyl stab1	$a_sc_su_sg_s$aac cUGAuGaggccguuaggccGaa Aauggca **B**	6361
1534	CGCACCU C UCUUUAC	6012	18363	HBV-1534 Rz-7 allyl stab1	$g_su_sa_sa_s$aga cUGAuGaggccguuaggccGaa Aggugcg **B**	6362
1536	CACCUCU C UUUACGC	6013	18364	HBV-1536 Rz-7 allyl stab1	$g_sc_sg_su_s$aaa cUGAuGaggccguuaggccGaa Agaggug **B**	6363
1538	CCUCUCU U UACGCGG	6014	18365	HBV-1538 Rz-7 allyl stab1	$c_sc_sg_sc_s$gua cUGAuGaggccguuaggccGaa Agagagg **B**	6364
1787	AGGCUGU A GGCAUAA	6015	18369	HBV-1787 Rz-7 allyl stab1	$u_su_sa_su_s$gcc cUGAuGaggccguuaggccGaa Acagccu **B**	6365
1793	UAGGCAU A AAUUGGU	6016	18370	HBV-1793 Rz-7 allyl stab1	$a_sc_sc_sa_s$auu cUGAuGaggccguuaggccGaa Augccua **B**	6366
1874	CAAGCCU C CAAGCUG	6017	18372	HBV-1874 Rz-7 allyl stab1	$c_sa_sg_sc_s$uug cUGAuGaggccguuaggccGaa Aggcuug **B**	6367
1887	UGUGCCU U GGGUGGC	6018	18373	HBV-1887 Rz-7 allyl stab1	$g_sc_sc_sa_s$ccc cUGAuGaggccguuaggccGaa Aggcaca **B**	6368
2383	AAGAACU C CCUCGCC	6019	18375	HBV-2383 Rz-7 allyl stab1	$g_sg_sc_sg_s$agg cUGAuGaggccguuaggccGaa Aguucuu **B**	6369
2828	ACCAUAU U CUUGGGA	6020	18377	HBV-2828 Rz-7 allyl stab1	$u_sc_sc_sc_s$aag cUGAuGaggccguuaggccGaa Auauggu **B**	6370
2829	CCAUAUU C UUGGGAA	6021	18378	HBV-2829 Rz-7 allyl stab1	$u_su_sc_sc_s$caa cUGAuGaggccguuaggccGaa Aauaugg **B**	6371
2831	AUAUUCU U GGGAACA	6022	18380	HBV-2831 Rz-7 allyl stab1	$u_sg_su_su_s$ccc cUGAuGaggccguuaggccGaa Agaauau **B**	6372
256	UCUAGAC U CGUGGUG	6023	18381	HBV-256 CHz-7 allyl stab1	$c_sa_sc_sc_s$acg cUGAuGaggccguuaggccGaa Iucuaga **B**	6373
267	GGUGGAC U UCUCUCA	6024	18382	HBV-267 CHz-7 allyl stab1	$u_sg_sa_sg_s$aga cUGAuGaggccguuaggccGaa Iuccacc **B**	6374
270	GGACUUC U CUCAAUU	6025	18383	HBV-270 CHz-7 allyl stab1	$a_sa_su_su_s$gag cUGAuGaggccguuaggccGaa Iaagucc **B**	6375
272	ACUUCUC U CAAUUUU	6026	18384	HBV-272 CHz-7 allyl stab1	$a_sa_sa_sa_s$uug cUGAuGaggccguuaggccGaa Iagaagu **B**	6376
274	UUCUCUC A AUUUUCU	6027	18385	HBV-274 CHz-7 allyl stab1	$a_sg_sa_sa_s$aau cUGAuGaggccguuaggccGaa Iagagaa **B**	6377
386	AUGUGUC U GCGGCGU	6028	18386	HBV-386 CHz-7 allyl stab1	$a_sc_sg_sc_s$cgc cUGAuGaggccguuaggccGaa Iacacau **B**	6378
419	AUCCUGC U GCUAUGC	6029	18387	HBV-419 CHz-7 allyl stab1	$g_sc_sa_su_s$agc cUGAuGaggccguuaggccGaa Icaggau **B**	6379
422	CUGCUGC U AUGCCUC	6030	18388	HBV-422 CHz-7 allyl stab1	$g_sa_sg_sg_s$cau cUGAuGaggccguuaggccGaa Icagcag **B**	6380
427	GCUAUGC C UCAUCUU	6031	18389	HBV-427 CHz-7 allyl stab1	$a_sa_sg_sa_s$uga cUGAuGaggccguuaggccGaa Icauagc **B**	6381
428	CUAUGCC U CAUCUUC	6032	18390	HBV-428 CHz-7 allyl stab1	$g_sa_sa_sg_s$aug cUGAuGaggccguuaggccGaa Igcauag **B**	6382
430	AUGCCUC A UCUUCUU	6033	18392	HBV-430 CHz-7 allyl stab1	$a_sa_sg_sa_s$aga cUGAuGaggccguuaggccGaa Iaggcau **B**	6383

Table 43

608	UGUAUUC C CAUCCCA	6034	18393	HBV-608 CHz-7 allyl stab1	$u_sg_sg_sg_s$aug cUGAuGaggccguuaggccGaa Iaauaca **B**	6384
609	GUAUUCC C AUCCCAU	6035	18394	HBV-609 CHz-7 allyl stab1	$a_su_sg_sg_s$gau cUGAuGaggccguuaggccGaa Igaauac **B**	6385
669	GUUUCUC U UGGCUCA	6036	18395	HBV-669 CHz-7 allyl stab1	$u_sg_sa_sg_s$cca cUGAuGaggccguuaggccGaa Iagaaac **B**	6386
689	CUAGUGC C AUUUGUU	6037	18398	HBV-689 CHz-7 allyl stab1	$a_sa_sc_sa_s$aau cUGAuGaggccguuaggccGaa Icacuag **B**	6387
690	UAGUGCC A UUUGUUC	6038	18399	HBV-690 CHz-7 allyl stab1	$g_sa_sa_sc_s$aaa cUGAuGaggccguuaggccGaa Igcacua **B**	6388
718	GCUUUCC C CCACUGU	6039	18400	HBV-718 CHz-7 allyl stab1	$a_sc_sa_sg_s$ugg cUGAuGaggccguuaggccGaa Igaaagc **B**	6389
1149	CCUUUAC C CCGUUGC	6040	18401	HBV-1149 CHz-7 allyl stab1	$g_sc_sa_sa_s$cgg cUGAuGaggccguuaggccGaa Iuaaagg **B**	6390
1535	GCACCUC U CUUUACG	6041	18408	HBV-1535 CHz-7 allyl stab1	$c_sg_su_sa_s$aag cUGAuGaggccguuaggccGaa Iaggugc **B**	6391
1537	ACCUCUC U UUACGCG	6042	18409	HBV-1537 CHz-7 allyl stab1	$c_sg_sc_sg_s$uaa cUGAuGaggccguuaggccGaa Iagaggu **B**	6392
1791	UGUAGGC A UAAAUUG	6043	18413	HBV-1791 CHz-7 allyl stab1	$c_sa_sa_su_s$uua cUGAuGaggccguuaggccGaa Iccuaca **B**	6393
1831	UUUUCAC C UCUGCCU	6044	18415	HBV-1831 CHz-7 allyl stab1	$a_sg_sg_sc_s$aga cUGAuGaggccguuaggccGaa Iugaaaa **B**	6394
1832	UUUCACC U CUGCCUA	6045	18416	HBV-1832 CHz-7 allyl stab1	$u_sa_sg_sg_s$cag cUGAuGaggccguuaggccGaa Igugaaa **B**	6395
1872	UUCAAGC C UCCAAGC	6046	18417	HBV-1872 CHz-7 allyl stab1	$g_sc_su_su_s$gga cUGAuGaggccguuaggccGaa Icuugaa **B**	6396
1873	UCAAGCC U CCAAGCU	6047	18418	HBV-1873 CHz-7 allyl stab1	$a_sg_sc_su_s$ugg cUGAuGaggccguuaggccGaa Igcuuga **B**	6397
1875	AAGCCUC C AAGCUGU	6048	18419	HBV-1875 CHz-7 allyl stab1	$a_sc_sa_sg_s$cuu cUGAuGaggccguuaggccGaa Iaggcuu **B**	6398
1876	AGCCUCC A AGCUGUG	6049	18421	HBV-1876 CHz-7 allyl stab1	$c_sa_sc_sa_s$gcu cUGAuGaggccguuaggccGaa Igaggcu **B**	6399
1880	UCCAAGC U GUGCCUU	6050	18423	HBV-1880 CHz-7 allyl stab1	$a_sa_sg_sg_s$cac cUGAuGaggccguuaggccGaa Icuugga **B**	6400
2382	GAAGAAC U CCCUCGC	6051	18424	HBV-2382 CHz-7 allyl stab1	$g_sc_sg_sa_s$ggg cUGAuGaggccguuaggccGaa Iuucuuc **B**	6401
2384	AGAACUC C CUCGCCU	6052	18425	HBV-2384 CHz-7 allyl stab1	$a_sg_sg_sc_s$gag cUGAuGaggccguuaggccGaa Iaguucu **B**	6402
2385	GAACUCC C UCGCCUC	6053	18426	HBV-2385 CHz-7 allyl stab1	$g_sa_sg_sg_s$cga cUGAuGaggccguuaggccGaa Igaguuc **B**	6403
2422	GCGUCGC A GAAGAUC	6054	18427	HBV-2422 CHz-7 allyl stab1	$g_sa_su_sc_s$uuc cUGAuGaggccguuaggccGaa Icgacgc **B**	6404
2830	CAUAUUC U UGGGAAC	6055	18428	HBV-2830 CHz-7 allyl stab1	$g_su_su_sc_s$cca cUGAuGaggccguuaggccGaa Iaauaug **B**	6405
234	AAUCCU C ACAAUA	6056	19179	HBV-234 Rz-6 amino stab1	$u_sa_su_su_s$gu c*U*GA*U*GaggccguuaggccGaa Aggauu **B**	6406
252	GAGUCU A GACUCG	6057	19180	HBV-252 Rz-6 amino stab1	$c_sg_sa_sg_s$uc c*U*GA*U*GaggccguuaggccGaa Agacuc **B**	6407
268	UGGACU U CUCUCA	6058	19182	HBV-268 Rz-6 amino stab1	$u_sg_sa_sg_s$ag c*U*GA*U*GaggccguuaggccGaa Agucca **B**	6408
280	AAUUUU C UAGGGG	6059	19190	HBV-280 Rz-6 amino stab1	$c_sc_sc_sc_s$ua c*U*GA*U*GaggccguuaggccGaa Aaaauu **B**	6409
313	CAAAAU U CGCAGU	6060	19191	HBV-313 Rz-6 amino stab1	$a_sc_su_sg_s$cg c*U*GA*U*GaggccguuaggccGaa Auuuug **B**	6410
395	GGCGUU U UAUCAU	6061	19195	HBV-395 Rz-6 amino stab1	$a_su_sg_sa_s$ua c*U*GA*U*GaggccguuaggccGaa Aacgcc **B**	6411
402	UAUCAU C UUCCUC	6062	19196	HBV-402 Rz-6 amino stab1	$g_sa_sg_sg_s$aa c*U*GA*U*GaggccguuaggccGaa Augaua **B**	6412
607	UGUAUU C CCAUCC	6063	19200	HBV-607 Rz-6 amino stab1	$g_sg_sa_su_s$gg c*U*GA*U*GaggccguuaggccGaa Aauaca **B**	6413
697	UUUGUU C AGUGGU	6064	19207	HBV-697 Rz-6 amino stab1	$a_sc_sc_sa_s$cu c*U*GA*U*GaggccguuaggccGaa Aacaaa **B**	6414

Table 43

1539	UCUCUU U ACGCGG	6065	19211	HBV-1539 Rz-6 amino stab1	$c_sc_sg_sc_s$gu c*U*GA*U*GaggccguuaggccGaa Aagaga **B**	6415
1599	UCACCU C UGCACG	6066	19212	HBV-1599 Rz-6 amino stab1	$c_sg_su_sg_s$ca c*U*GA*U*GaggccguuaggccGaa Agguga **B**	6416
1607	GCACGU C GCAUGG	6067	19213	HBV-1607 Rz-6 amino stab1	$c_sc_sa_su_s$gc c*U*GA*U*GaggccguuaggccGaa Acgugc **B**	6417
1833	UCACCU C UGCCUA	6068	19216	HBV-1833 Rz-6 amino stab1	$u_sa_sg_sg_s$ca c*U*GA*U*GaggccguuaggccGaa Agguga **B**	6418
2383	AGAACU C CCUCGC	6069	19219	HBV-2383 Rz-6 amino stab1	$g_sc_sg_sa_s$gg c*U*GA*U*GaggccguuaggccGaa Aguucu **B**	6419
2429	GAAGAU C UCAAUC	6070	19221	HBV-2429 Rz-6 amino stab1	$g_sa_su_su_s$ga c*U*GA*U*GaggccguuaggccGaa Aucuuc **B**	6420
2831	UAUUCU U GGGAAC	6071	19224	HBV-2831 Rz-6 amino stab1	$g_su_su_sc_s$cc c*U*GA*U*GaggccguuaggccGaa Agaaua **B**	6421
430	UGCCUC A UCUUCU	6072	19236	HBV-430 CHz-6 amino stab1	$a_sg_sa_sa_s$ga c*U*GA*U*GaggccguuaggccGaa Iaggca **B**	6422
676	UGGCUC A GUUUAC	6073	19241	HBV-676 CHz-6 amino stab1	$g_su_sa_sa_s$ac c*U*GA*U*GaggccguuaggccGaa Iagcca **B**	6423
683	GUUUAC U AGUGCC	6074	19242	HBV-683 CHz-6 amino stab1	$g_sg_sc_sa_s$cu c*U*GA*U*GaggccguuaggccGaa Iuaaac **B**	6424
1150	UUUACC C CGUUGC	6075	19247	HBV-1150 CHz-6 amino stab1	$g_sc_sa_sa_s$cg c*U*GA*U*GaggccguuaggccGaa Iguaaa **B**	6425
1200	GCAACC C CCACUG	6076	19248	HBV-1200 CHz-6 amino stab1	$c_sa_sg_su_s$gg c*U*GA*U*GaggccguuaggccGaa Iguugc **B**	6426
1201	CAACCC C CACUGG	6077	19249	HBV-1201 CHz-6 amino stab1	$c_sc_sa_sg_s$ug c*U*GA*U*GaggccguuaggccGaa Igguug **B**	6427
1444	CGGCGC U GAAUCC	6078	19250	HBV-1444 CHz-6 amino stab1	$g_sg_sa_su_s$uc c*U*GA*U*GaggccguuaggccGaa Icgccg **B**	6428
1451	GAAUCC C GCGGAC	6079	19251	HBV-1451 CHz-6 amino stab1	$g_su_sc_sc_s$gc c*U*GA*U*GaggccguuaggccGaa Igauuc **B**	6429
1533	CGCACC U CUCUUU	6080	19252	HBV-1533 CHz-6 amino stab1	$a_sa_sa_sg_s$ag c*U*GA*U*GaggccguuaggccGaa Igugcg **B**	6430
1600	CACCUC U GCACGU	6081	19255	HBV-1600 CHz-6 amino stab1	$a_sc_sg_su_s$gc c*U*GA*U*GaggccguuaggccGaa Iaggug **B**	6431
1698	CCGACC U UGAGGC	6082	19256	HBV-1698 CHz-6 amino stab1	$g_sc_sc_su_s$ca c*U*GA*U*GaggccguuaggccGaa Igucgg **B**	6432
1784	GGAGGC U GUAGGC	6083	19257	HBV-1784 CHz-6 amino stab1	$g_sc_sc_su_s$ac c*U*GA*U*GaggccguuaggccGaa Iccucc **B**	6433
1829	UUUUUC A CCUCUG	6084	19259	HBV-1829 CHz-6 amino stab1	$c_sa_sg_sa_s$gg c*U*GA*U*GaggccguuaggccGaa Iaaaaa **B**	6434
1876	GCCUCC A AGCUGU	6085	19265	HBV-1876 CHz-6 amino stab1	$a_sc_sa_sg_s$cu c*U*GA*U*GaggccguuaggccGaa Igaggc **B**	6435
1880	CCAAGC U GUGCCU	6086	19267	HBV-1880 CHz-6 amino stab1	$a_sg_sg_sc_s$ac c*U*GA*U*GaggccguuaggccGaa Icuugg **B**	6436
218	UUUUUCU U GUUGACA	6087	19178	HBV-218 Rz-7 amino stab1	$u_sg_su_sc_s$aac c*U*GA*U*GaggccguuaggccGaa Agaaaaa **B**	6437
257	CUAGACU C GUGGUGG	6088	19181	HBV-257 Rz-7 amino stab1	$c_sc_sa_sc_s$cac c*U*GA*U*GaggccguuaggccGaa Agucuag **B**	6438
268	GUGGACU U CUCUCAA	6089	19183	HBV-268 Rz-7 amino stab1	$u_su_sg_sa_s$gag c*U*GA*U*GaggccguuaggccGaa Aguccac **B**	6439
269	UGGACUU C UCUCAAU	6090	19184	HBV-269 Rz-7 amino stab1	$a_su_su_sg_s$aga c*U*GA*U*GaggccguuaggccGaa Aagucca **B**	6440
271	GACUUCU C UCAAUUU	6091	19185	HBV-271 Rz-7 amino stab1	$a_sa_sa_su_s$uga c*U*GA*U*GaggccguuaggccGaa Agaaguc **B**	6441
273	CUUCUCU C AAUUUUC	6092	19186	HBV-273 Rz-7 amino stab1	$g_sa_sa_sa_s$auu c*U*GA*U*GaggccguuaggccGaa Agagaag **B**	6442
277	UCUCAAU U UUCUAGG	6093	19187	HBV-277 Rz-7 amino stab1	$c_sc_su_sa_s$gaa c*U*GA*U*GaggccguuaggccGaa Auugaga **B**	6443
278	CUCAAUU U UCUAGGG	6094	19188	HBV-278 Rz-7 amino stab1	$c_sc_sc_su_s$aga c*U*GA*U*GaggccguuaggccGaa Aauugag **B**	6444
279	UCAAUUU U CUAGGGG	6095	19189	HBV-279 Rz-7 amino stab1	$c_sc_sc_sc_s$uag c*U*GA*U*GaggccguuaggccGaa Aaauuga **B**	6445

Table 43

314	CAAAAUU C GCAGUCC	6096	19192	HBV-314 Rz-7 amino stab1	$g_sg_sa_sc_s$ugc c*U*GA*U*GaggccguuaggccGaa Aauuuug **B**	6446
385	GAUGUGU C UGCGGCG	6097	19193	HBV-385 Rz-7 amino stab1	$c_sg_sc_sc_s$gca c*U*GA*U*GaggccguuaggccGaa Acacauc **B**	6447
394	GCGGCGU U UUAUCAU	6098	19194	HBV-394 Rz-7 amino stab1	$a_su_sg_sa_s$uaa c*U*GA*U*GaggccguuaggccGaa Acgccgc **B**	6448
402	UUAUCAU C UUCCUCU	6099	19197	HBV-402 Rz-7 amino stab1	$a_sg_sa_sg_s$gaa c*U*GA*U*GaggccguuaggccGaa Augauaa **B**	6449
423	UGCUGCU A UGCCUCA	6100	19198	HBV-423 Rz-7 amino stab1	$u_sg_sa_sg_s$gca c*U*GA*U*GaggccguuaggccGaa Agcagca **B**	6450
429	UAUGCCU C AUCUUCU	6101	19199	HBV-429 Rz-7 amino stab1	$a_sg_sa_sa_s$gau c*U*GA*U*GaggccguuaggccGaa Aggcaua **B**	6451
679	GCUCAGU U UACUAGU	6102	19201	HBV-679 Rz-7 amino stab1	$a_sc_su_sa_s$gua c*U*GA*U*GaggccguuaggccGaa Acugagc **B**	6452
680	CUCAGUU U ACUAGUG	6103	19202	HBV-680 Rz-7 amino stab1	$c_sa_sc_su_s$agu c*U*GA*U*GaggccguuaggccGaa Aacugag **B**	6453
681	UCAGUUU A CUAGUGC	6104	19203	HBV-681 Rz-7 amino stab1	$g_sc_sa_sc_s$uag c*U*GA*U*GaggccguuaggccGaa Aaacuga **B**	6454
684	GUUUACU A GUGCCAU	6105	19204	HBV-684 Rz-7 amino stab1	$a_su_sg_sg_s$cac c*U*GA*U*GaggccguuaggccGaa Aguaaac **B**	6455
692	GUGCCAU U UGUUCAG	6106	19205	HBV-692 Rz-7 amino stab1	$c_su_sg_sa_s$aca c*U*GA*U*GaggccguuaggccGaa Auggcac **B**	6456
693	UGCCAUU U GUUCAGU	6107	19206	HBV-693 Rz-7 amino stab1	$a_sc_su_sg_s$aac c*U*GA*U*GaggccguuaggccGaa Aauggca **B**	6457
1534	CGCACCU C UCUUUAC	6108	19208	HBV-1534 Rz-7 amino stab1	$g_su_sa_sa_s$aga c*U*GA*U*GaggccguuaggccGaa Aggugcg **B**	6458
1536	CACCUCU C UUUACGC	6109	19209	HBV-1536 Rz-7 amino stab1	$g_sc_sg_su_s$aaa c*U*GA*U*GaggccguuaggccGaa Agaggug **B**	6459
1538	CCUCUCU U UACGCGG	6110	19210	HBV-1538 Rz-7 amino stab1	$c_sc_sg_sc_s$gua c*U*GA*U*GaggccguuaggccGaa Agagagg **B**	6460
1787	AGGCUGU A GGCAUAA	6111	19214	HBV-1787 Rz-7 amino stab1	$u_su_sa_su_s$gcc c*U*GA*U*GaggccguuaggccGaa Acagccu **B**	6461
1793	UAGGCAU A AAUUGGU	6112	19215	HBV-1793 Rz-7 amino stab1	$a_sc_sc_sa_s$auu c*U*GA*U*GaggccguuaggccGaa Augccua **B**	6462
1874	CAAGCCU C CAAGCUG	6113	19217	HBV-1874 Rz-7 amino stab1	$c_sa_sg_sc_s$uug c*U*GA*U*GaggccguuaggccGaa Aggcuug **B**	6463
1887	UGUGCCU U GGGUGGC	6114	19218	HBV-1887 Rz-7 amino stab1	$g_sc_sc_sa_s$ccc c*U*GA*U*GaggccguuaggccGaa Aggcaca **B**	6464
2383	AAGAACU C CCUCGCC	6115	19220	HBV-2383 Rz-7 amino stab1	$g_sg_sc_sg_s$agg c*U*GA*U*GaggccguuaggccGaa Aguucuu **B**	6465
2828	ACCAUAU U CUUGGGA	6116	19222	HBV-2828 Rz-7 amino stab1	$u_sc_sc_sc_s$aag c*U*GA*U*GaggccguuaggccGaa Auauggu **B**	6466
2829	CCAUAUU C UUGGGAA	6117	19223	HBV-2829 Rz-7 amino stab1	$u_su_sc_sc_s$caa c*U*GA*U*GaggccguuaggccGaa Aauaugg **B**	6467
2831	AUAUUCU U GGGAACA	6118	19225	HBV-2831 Rz-7 amino stab1	$u_sg_su_su_s$ccc c*U*GA*U*GaggccguuaggccGaa Agaauau **B**	6468
256	UCUAGAC U CGUGGUG	6119	19226	HBV-256 CHz-7 amino stab1	$c_sa_sc_sc_s$acg c*U*GA*U*GaggccguuaggccGaa lucuaga **B**	6469
267	GGUGGAC U UCUCUCA	6120	19227	HBV-267 CHz-7 amino stab1	$u_sg_sa_sg_s$aga c*U*GA*U*GaggccguuaggccGaa luccacc **B**	6470
270	GGACUUC U CUCAAUU	6121	19228	HBV-270 CHz-7 amino stab1	$a_sa_su_su_s$gag c*U*GA*U*GaggccguuaggccGaa laagucc **B**	6471
272	ACUUCUC U CAAUUUU	6122	19229	HBV-272 CHz-7 amino stab1	$a_sa_sa_sa_s$uug c*U*GA*U*GaggccguuaggccGaa lagaagu **B**	6472
274	UUCUCUC A AUUUUCU	6123	19230	HBV-274 CHz-7 amino stab1	$a_sg_sa_sa_s$aau c*U*GA*U*GaggccguuaggccGaa lagagaa **B**	6473
386	AUGUGUC U GCGGCGU	6124	19231	HBV-386 CHz-7 amino stab1	$a_sc_sg_sc_s$cgc c*U*GA*U*GaggccguuaggccGaa lacacau **B**	6474
419	AUCCUGC U GCUAUGC	6125	19232	HBV-419 CHz-7 amino stab1	$g_sc_sa_su_s$agc c*U*GA*U*GaggccguuaggccGaa lcaggau **B**	6475
422	CUGCUGC U AUGCCUC	6126	19233	HBV-422 CHz-7 amino stab1	$g_sa_sg_sg_s$cau c*U*GA*U*GaggccguuaggccGaa lcagcag **B**	6476

Table 43

427	GCUAUGC C UCAUCUU	6127	19234	HBV-427 CHz-7 amino stab1	$a_sa_sg_sa_s$uga c*U*GA*U*GaggccguuaggccGaa Icauagc **B**	6477
428	CUAUGCC U CAUCUUC	6128	19235	HBV-428 CHz-7 amino stab1	$g_sa_sa_sg_s$aug c*U*GA*U*GaggccguuaggccGaa Igcauag **B**	6478
430	AUGCCUC A UCUUCUU	6129	19237	HBV-430 CHz-7 amino stab1	$a_sa_sg_sa_s$aga c*U*GA*U*GaggccguuaggccGaa Iaggcau **B**	6479
608	UGUAUUC C CAUCCCA	6130	19238	HBV-608 CHz-7 amino stab1	$u_sg_sg_sg_s$aug c*U*GA*U*GaggccguuaggccGaa Iaauaca **B**	6480
609	GUAUUCC C AUCCCAU	6131	19239	HBV-609 CHz-7 amino stab1	$a_su_sg_sg_s$gau c*U*GA*U*GaggccguuaggccGaa Igaauac **B**	6481
669	GUUUCUC U UGGCUCA	6132	19240	HBV-669 CHz-7 amino stab1	$u_sg_sa_sg_s$cca c*U*GA*U*GaggccguuaggccGaa Iagaaac **B**	6482
689	CUAGUGC C AUUUGUU	6133	19243	HBV-689 CHz-7 amino stab1	$a_sa_sc_sa_s$aau c*U*GA*U*GaggccguuaggccGaa Icacuag **B**	6483
690	UAGUGCC A UUUGUUC	6134	19244	HBV-690 CHz-7 amino stab1	$g_sa_sa_sc_s$aaa c*U*GA*U*GaggccguuaggccGaa Igcacua **B**	6484
718	GCUUUCC C CCACUGU	6135	19245	HBV-718 CHz-7 amino stab1	$a_sc_sa_sg_s$ugg c*U*GA*U*GaggccguuaggccGaa Igaaagc **B**	6485
1149	CCUUUAC C CCGUUGC	6136	19246	HBV-1149 CHz-7 amino stab1	$g_sc_sa_sa_s$cgg c*U*GA*U*GaggccguuaggccGaa Iuaaagg **B**	6486
1535	GCACCUC U CUUUACG	6137	19253	HBV-1535 CHz-7 amino stab1	$c_sg_su_sa_s$aag c*U*GA*U*GaggccguuaggccGaa Iaggugc **B**	6487
1537	ACCUCUC U UUACGCG	6138	19254	HBV-1537 CHz-7 amino stab1	$c_sg_sc_sg_s$uaa c*U*GA*U*GaggccguuaggccGaa Iagaggu **B**	6488
1791	UGUAGGC A UAAAUUG	6139	19258	HBV-1791 CHz-7 amino stab1	$c_sa_sa_su_s$uua c*U*GA*U*GaggccguuaggccGaa Iccuaca **B**	6489
1831	UUUUCAC C UCUGCCU	6140	19260	HBV-1831 CHz-7 amino stab1	$a_sg_sg_sc_s$aga c*U*GA*U*GaggccguuaggccGaa Iugaaaa **B**	6490
1832	UUUCACC U CUGCCUA	6141	19261	HBV-1832 CHz-7 amino stab1	$u_sa_sg_sg_s$cag c*U*GA*U*GaggccguuaggccGaa Igugaaa **B**	6491
1872	UUCAAGC C UCCAAGC	6142	19262	HBV-1872 CHz-7 amino stab1	$g_sc_su_su_s$gga c*U*GA*U*GaggccguuaggccGaa Icuugaa **B**	6492
1873	UCAAGCC U CCAAGCU	6143	19263	HBV-1873 CHz-7 amino stab1	$a_sg_sc_su_s$ugg c*U*GA*U*GaggccguuaggccGaa Igcuuga **B**	6493
1875	AAGCCUC C AAGCUGU	6144	19264	HBV-1875 CHz-7 amino stab1	$a_sc_sa_sg_s$cuu c*U*GA*U*GaggccguuaggccGaa Iaggcuu **B**	6494
1876	AGCCUCC A AGCUGUG	6145	19266	HBV-1876 CHz-7 amino stab1	$c_sa_sc_sa_s$gcu c*U*GA*U*GaggccguuaggccGaa Igaggcu **B**	6495
1880	UCCAAGC U GUGCCUU	6146	19268	HBV-1880 CHz-7 amino stab1	$a_sa_sg_sg_s$cac c*U*GA*U*GaggccguuaggccGaa Icuugga **B**	6496
2382	GAAGAAC U CCCUCGC	6147	19269	HBV-2382 CHz-7 amino stab1	$g_sc_sg_sa_s$ggg c*U*GA*U*GaggccguuaggccGaa Iuucuuc **B**	6497
2384	AGAACUC C CUCGCCU	6148	19270	HBV-2384 CHz-7 amino stab1	$a_sg_sg_sc_s$gag c*U*GA*U*GaggccguuaggccGaa Iaguucu **B**	6498
2385	GAACUCC C UCGCCUC	6149	19271	HBV-2385 CHz-7 amino stab1	$g_sa_sg_sg_s$cga c*U*GA*U*GaggccguuaggccGaa Igaguuc **B**	6499
2422	GCGUCGC A GAAGAUC	6150	19272	HBV-2422 CHz-7 amino stab1	$g_sa_su_sc_s$uuc c*U*GA*U*GaggccguuaggccGaa Icgacgc **B**	6500
2830	CAUAUUC U UGGGAAC	6151	19273	HBV-2830 CHz-7 amino stab1	$g_su_su_sc_s$cca c*U*GA*U*GaggccguuaggccGaa Iaauaug **B**	6501
315	GCCAAAAUUC G CAGUC	6152	20079	HBV-315 GCI.Rz-5/10 stab2	$g_sa_sc_s$g uGAU$_s$g gcauGcacuaugc gcg gaauuuuggc **B**	6502
381	AUCGCUGGAU G UGUCU	6153	20080	HBV-381 GCI.Rz-5/10 stab2	$a_sg_sa_s$a uGAU$_s$g gcauGcacuaugc gcg auccagcgau **B**	6503
476	UUGCCCGUUU G UCCUC	6154	20081	HBV-476 GCI.Rz-5/10 stab2	$g_sa_sg_s$a uGAU$_s$g gcauGcacuaugc gcg aaacgggcaa **B**	6504
694	AGUGCCAUUU G UUCAG	6155	20082	HBV-694 GCI.Rz-5/10 stab2	$c_su_sg_s$a uGAU$_s$g gcauGcacuaugc gcg aaauggcacu **B**	6505
1265	CUCCUCUGCC G AUCCA	6156	20083	HBV-1265 GCI.Rz-5/10 stab2	$u_sg_sg_s$u uGAU$_s$g gcauGcacuaugc gcg ggcagaggag **B**	6506
1601	CUUCACCUCU G CACGU	6157	20084	HBV-1601 GCI.Rz-5/10 stab2	$a_sc_sg_s$g uGAU$_s$g gcauGcacuaugc gcg agaggugaag **B**	6507

Table 43

1881	CCUCCAAGCU G UGCCU	6158	20085	HBV-1881 GCl.Rz-5/10 stab2	$a_sg_sg_sa$ uGAU$_s$g gcauGcacuaugc gcg agcuuggagg B	6508
1883	UCCAAGCUGU G CCUUG	6159	20086	HBV-1883 GCl.Rz-5/10 stab2	$c_sa_sa_sg$ uGAU$_s$g gcauGcacuaugc gcg acagcuugga B	6509
2388	GAACUCCCUC G CCUCG	6160	20087	HBV-2388 GCl.Rz-5/10 stab2	$c_sg_sa_sg$ uGAU$_s$g gcauGcacuaugc gcg gagggaguuc B	6510
381	GCUGGAU G UGUCUGC	6161	20091	HBV-381 Zin.Rz-7 amino stab2	$g_sc_sa_sg_saca$ GccgaaagGCGaGugaGGuCu auccagc B	6511
392	CUGCGGC G UUUUAUC	6162	20092	HBV-392 Zin.Rz-7 amino stab2	$g_sa_su_sa_saaa$ GccgaaagGCGaGugaGGuCu gccgcag B	6512
420	UCCUGCU G CUAUGCC	6163	20093	HBV-420 Zin.Rz-7 amino stab2	$g_sg_sc_sa_suag$ GccgaaagGCGaGugaGGuCu agcagga B	6513
648	UAUGGGA G UGGGCCU	6164	20094	HBV-648 Zin.Rz-7 amino stab2	$a_sg_sg_sc_scca$ GccgaaagGCGaGugaGGuCu ucccaua B	6514
711	UCGUAGG G CUUUCCC	6165	20095	HBV-711 Zin.Rz-7 amino stab2	$g_sg_sg_sa_saag$ GccgaaagGCGaGugaGGuCu ccuacga B	6515
1262	CUCCUCU G CCGAUCC	6166	20096	HBV-1262 Zin.Rz-7 amino stab2	$g_sg_sa_su_scgg$ GccgaaagGCGaGugaGGuCu agaggag B	6516
1835	CACCUCU G CCUAAUC	6167	20097	HBV-1835 Zin.Rz-7 amino stab2	$g_sa_su_su_sagg$ GccgaaagGCGaGugaGGuCu agaggug B	6517
2388	CUCCCUC G CCUCGCA	6168	20098	HBV-2388 Zin.Rz-7 amino stab2	$u_sg_sc_sg_sagg$ GccgaaagGCGaGugaGGuCu gagggag B	6518
192	GACCCCU G CUCGUGU	6169	20099	HBV-192 Zin.Rz-7 amino stab2	$a_sc_sa_sc_sgag$ GccgaaagGCGaGugaGGuCu aggggguc B	6519
198	UGCUCGU G UUACAGG	6170	20100	HBV-198 Zin.Rz-7 amino stab2	$c_sc_su_sg_suaa$ GccgaaagGCGaGugaGGuCu acgagca B	6520
315	AAAAUUC G CAGUCCC	6171	20101	HBV-315 Zin.Rz-7 amino stab2	$g_sg_sg_sa_scug$ GccgaaagGCGaGugaGGuCu gaauuuu B	6521
383	GGAUGU G UCUGCG	6172	20102	HBV-383 Zin.Rz-6 amino stab2	$c_sg_sc_sa_sga$ GccgaaagGCGaGugaGGuCu acaucc B	6522
383	UGGAUGU G UCUGCGG	6173	20103	HBV-383 Zin.Rz-7 amino stab2	$c_sc_sg_sc_saga$ GccgaaagGCGaGugaGGuCu acaucca B	6523
387	GUGUCU G CGGCGU	6174	20104	HBV-387 Zin.Rz-6 amino stab2	$a_sc_sg_sc_scg$ GccgaaagGCGaGugaGGuCu agacac B	6524
390	GUCUGCG G CGUUUUA	6175	20105	HBV-390 Zin.Rz-7 amino stab2	$u_sa_sa_sa_sacg$ GccgaaagGCGaGugaGGuCu cgcagac B	6525
392	UGCGGC G UUUUAU	6176	20106	HBV-392 Zin.Rz-6 amino stab2	$a_su_sa_sa_saa$ GccgaaagGCGaGugaGGuCu gccgca B	6526
425	UGCUAU G CCUCAU	6177	20107	HBV-425 Zin.Rz-6 amino stab2	$a_su_sg_sa_sgg$ GccgaaagGCGaGugaGGuCu auagca B	6527
425	CUGCUAU G CCUCAUC	6178	20108	HBV-425 Zin.Rz-7 amino stab2	$g_sa_su_sg_sagg$ GccgaaagGCGaGugaGGuCu auagcag B	6528
468	GUAUGUU G CCCGUUU	6179	20109	HBV-468 Zin.Rz-7 amino stab2	$a_sa_sa_sc_sggg$ GccgaaagGCGaGugaGGuCu aacauac B	6529
476	CCCGUUU G UCCUCUA	6180	20110	HBV-476 Zin.Rz-7 amino stab2	$u_sa_sg_sa_sgga$ GccgaaagGCGaGugaGGuCu aaacggg B	6530
648	AUGGGA G UGGGCC	6181	20111	HBV-648 Zin.Rz-6 amino stab2	$g_sg_sc_sc_sca$ GccgaaagGCGaGugaGGuCu ucccau B	6531
694	GCCAUUU G UUCAGUG	6182	20112	HBV-694 Zin.Rz-7 amino stab2	$c_sa_sc_su_sgaa$ GccgaaagGCGaGugaGGuCu aaauggc B	6532
699	UUGUUCA G UGGUUCG	6183	20113	HBV-699 Zin.Rz-7 amino stab2	$c_sg_sa_sa_scca$ GccgaaagGCGaGugaGGuCu ugaacaa B	6533
1262	UCCUCU G CCGAUC	6184	20114	HBV-1262 Zin.Rz-6 amino stab2	$g_sa_su_sc_sgg$ GccgaaagGCGaGugaGGuCu agagga B	6534
1440	CCCGUCG G CGCUGAA	6185	20115	HBV-1440 Zin.Rz-7 amino stab2	$u_su_sc_sa_sgcg$ GccgaaagGCGaGugaGGuCu cgacggg B	6535
1526	CACGGG G CGCACC	6186	20116	HBV-1526 Zin.Rz-6 amino stab2	$g_sg_su_sg_scg$ GccgaaagGCGaGugaGGuCu cccgug B	6536
1526	CCACGGG G CGCACCU	6187	20117	HBV-1526 Zin.Rz-7 amino stab2	$a_sg_sg_su_sgcg$ GccgaaagGCGaGugaGGuCu cccgugg B	6537
1557	CCCGUCU G UGCCUUC	6188	20118	HBV-1557 Zin.Rz-7 amino stab2	$g_sa_sa_sg_sgca$ GccgaaagGCGaGugaGGuCu agacggg B	6538

Table 43

1559	CGUCUGU G CCUUCUC	6189	20119	HBV-1559 Zin.Rz-7 amino stab2	$g_sa_sg_sa_s$agg GccgaaagGCGaGugaGGuCu acagacg **B**	6539
1590	GCACUUC G CUUCACC	6190	20120	HBV-1590 Zin.Rz-7 amino stab2	$g_sg_su_sg_s$aag GccgaaagGCGaGugaGGuCu gaagugc **B**	6540
1835	ACCUCU G CCUAAU	6191	20121	HBV-1835 Zin.Rz-6 amino stab2	$a_su_su_sa_s$gg GccgaaagGCGaGugaGGuCu agaggu **B**	6541
2311	ACCAAAU G CCCCUAU	6192	20122	HBV-2311 Zin.Rz-7 amino stab2	$a_su_sa_sg_s$ggg GccgaaagGCGaGugaGGuCu auuuggu **B**	6542
2420	CCGCGUC G CAGAAGA	6193	20123	HBV-2420 Zin.Rz-7 amino stab2	$u_sc_su_su_s$cug GccgaaagGCGaGugaGGuCu gacgcgg **B**	6543
65	CCUGCUG G UGGCUCC	6194	20124	HBV-65 Zin.Rz-7 amino stab2	$g_sg_sa_sg_s$cca GccgaaagGCGaGugaGGuCu cagcagg **B**	6544
192	ACCCCU G CUCGUG	6195	20125	HBV-192 Zin.Rz-6 amino stab2	$c_sa_sc_sg_s$ag GccgaaagGCGaGugaGGuCu aggggu **B**	6545
198	GCUCGU G UUACAG	6196	20126	HBV-198 Zin.Rz-6 amino stab2	$c_su_sg_su_s$aa GccgaaagGCGaGugaGGuCu acgagc **B**	6546
258	UAGACUC G UGGUGGA	6197	20127	HBV-258 Zin.Rz-7 amino stab2	$u_sc_sc_sa_s$cca GccgaaagGCGaGugaGGuCu gagucua **B**	6547
261	ACUCGUG G UGGACUU	6198	20128	HBV-261 Zin.Rz-7 amino stab2	$a_sa_sg_su_s$cca GccgaaagGCGaGugaGGuCu cacgagu **B**	6548
315	AAAUUC G CAGUCC	6199	20129	HBV-315 Zin.Rz-6 amino stab2	$g_sg_sa_sc_s$ug GccgaaagGCGaGugaGGuCu gaauuu **B**	6549
381	CUGGAU G UGUCUG	6200	20130	HBV-381 Zin.Rz-6 amino stab2	$c_sa_sg_sa_s$ca GccgaaagGCGaGugaGGuCu auccag **B**	6550
387	UGUGUCU G CGGCGUU	6201	20131	HBV-387 Zin.Rz-7 amino stab2	$a_sa_sc_sg_s$ccg GccgaaagGCGaGugaGGuCu agacaca **B**	6551
390	UCUGCG G CGUUUU	6202	20132	HBV-390 Zin.Rz-6 amino stab2	$a_sa_sa_sa_s$cg GccgaaagGCGaGugaGGuCu cgcaga **B**	6552
417	CAUCCU G CUGCUA	6203	20133	HBV-417 Zin.Rz-6 amino stab2	$u_sa_sg_sc_s$ag GccgaaagGCGaGugaGGuCu aggaug **B**	6553
420	CCUGCU G CUAUGC	6204	20134	HBV-420 Zin.Rz-6 amino stab2	$g_sc_sa_su_s$ag GccgaaagGCGaGugaGGuCu agcagg **B**	6554
468	UAUGUU G CCCGUU	6205	20135	HBV-468 Zin.Rz-6 amino stab2	$a_sa_sc_sg_s$gg GccgaaagGCGaGugaGGuCu aacaua **B**	6555
476	CCGUUU G UCCUCU	6206	20136	HBV-476 Zin.Rz-6 amino stab2	$a_sg_sa_sg_s$ga GccgaaagGCGaGugaGGuCu aaacgg **B**	6556
677	GGCUCA G UUUACU	6207	20137	HBV-677 Zin.Rz-6 amino stab2	$a_sg_su_sa_s$aa GccgaaagGCGaGugaGGuCu ugagcc **B**	6557
677	UGGCUCA G UUUACUA	6208	20138	HBV-677 Zin.Rz-7 amino stab2	$u_sa_sg_su_s$aaa GccgaaagGCGaGugaGGuCu ugagcca **B**	6558
685	UUACUA G UGCCAU	6209	20139	HBV-685 Zin.Rz-6 amino stab2	$a_su_sg_sg_s$ca GccgaaagGCGaGugaGGuCu uaguaa **B**	6559
685	UUUACUA G UGCCAUU	6210	20140	HBV-685 Zin.Rz-7 amino stab2	$a_sa_su_sg_s$gca GccgaaagGCGaGugaGGuCu uaguaaa **B**	6560
687	UACUAGU G CCAUUUG	6211	20141	HBV-687 Zin.Rz-7 amino stab2	$c_sa_sa_sa_s$ugg GccgaaagGCGaGugaGGuCu acuagua **B**	6561
699	UGUUCA G UGGUUC	6212	20142	HBV-699 Zin.Rz-6 amino stab2	$g_sa_sa_sc_s$ca GccgaaagGCGaGugaGGuCu ugaaca **B**	6562
702	UCAGUG G UUCGUA	6213	20143	HBV-702 Zin.Rz-6 amino stab2	$u_sa_sc_sg_s$aa GccgaaagGCGaGugaGGuCu cacuga **B**	6563
702	UUCAGUG G UUCGUAG	6214	20144	HBV-702 Zin.Rz-7 amino stab2	$c_su_sa_sc_s$gaa GccgaaagGCGaGugaGGuCu cacugaa **B**	6564
711	CGUAGG G CUUUCC	6215	20145	HBV-711 Zin.Rz-6 amino stab2	$g_sg_sa_sa_s$ag GccgaaagGCGaGugaGGuCu ccuacg **B**	6565
1006	UUGUGG G UCUUUU	6216	20146	HBV-1006 Zin.Rz-6 amino stab2	$a_sa_sa_sa_s$ga GccgaaagGCGaGugaGGuCu ccacaa **B**	6566
1103	UUUCUC G CCAACU	6217	20147	HBV-1103 Zin.Rz-6 amino stab2	$a_sg_su_su_s$gg GccgaaagGCGaGugaGGuCu gagaaa **B**	6567
1103	CUUUCUC G CCAACUU	6218	20148	HBV-1103 Zin.Rz-7 amino stab2	$a_sa_sg_su_s$ugg GccgaaagGCGaGugaGGuCu gagaaag **B**	6568
1184	GCCAAGU G UUUGCUG	6219	20149	HBV-1184 Zin.Rz-7 amino stab2	$c_sa_sg_sc_s$aaa GccgaaagGCGaGugaGGuCu acuuggc **B**	6569

Table 43

1440	CCGUCG G CGCUGA	6220	20150	HBV-1440 Zin.Rz-6 amino stab2	$u_s c_s a_s g_s$cg GccgaaagG***C***GaGugaGGu***C***u cgacgg **B**	6570
1442	GUCGGC G CUGAAU	6221	20151	HBV-1442 Zin.Rz-6 amino stab2	$a_s u_s u_s c_s$ag GccgaaagG***C***GaGugaGGu***C***u gccgac **B**	6571
1442	CGUCGGC G CUGAAUC	6222	20152	HBV-1442 Zin.Rz-7 amino stab2	$g_s a_s u_s u_s$cag GccgaaagG***C***GaGugaGGu***C***u gccgacg **B**	6572
1553	CUCCCC G UCUGUG	6223	20153	HBV-1553 Zin.Rz-6 amino stab2	$c_s a_s c_s a_s$ga GccgaaagG***C***GaGugaGGu***C***u ggggag **B**	6573
1557	CCGUCU G UGCCUU	6224	20154	HBV-1557 Zin.Rz-6 amino stab2	$a_s a_s g_s g_s$ca GccgaaagG***C***GaGugaGGu***C***u agacgg **B**	6574
1559	GUCUGU G CCUUCU	6225	20155	HBV-1559 Zin.Rz-6 amino stab2	$a_s g_s a_s a_s$gg GccgaaagG***C***GaGugaGGu***C***u acagac **B**	6575
1583	CCGUGU G CACUUC	6226	20156	HBV-1583 Zin.Rz-6 amino stab2	$g_s a_s a_s g_s$ug GccgaaagG***C***GaGugaGGu***C***u acacgg **B**	6576
1590	CACUUC G CUUCAC	6227	20157	HBV-1590 Zin.Rz-6 amino stab2	$g_s u_s g_s a_s$ag GccgaaagG***C***GaGugaGGu***C***u gaagug **B**	6577
1622	ACCACC G UGAACG	6228	20158	HBV-1622 Zin.Rz-6 amino stab2	$c_s g_s u_s u_s$ca GccgaaagG***C***GaGugaGGu***C***u gguggu **B**	6578
1870	UGUUCAA G CCUCCAA	6229	20159	HBV-1870 Zin.Rz-7 amino stab2	$u_s u_s g_s g_s$agg GccgaaagG***C***GaGugaGGu***C***u uugaaca **B**	6579
1881	CCAAGCU G UGCCUUG	6230	20160	HBV-1881 Zin.Rz-7 amino stab2	$c_s a_s a_s g_s$gca GccgaaagG***C***GaGugaGGu***C***u agcuugg **B**	6580
1883	AGCUGU G CCUUGG	6231	20161	HBV-1883 Zin.Rz-6 amino stab2	$c_s c_s a_s a_s$gg GccgaaagG***C***GaGugaGGu***C***u acagcu **B**	6581
1883	AAGCUGU G CCUUGGG	6232	20162	HBV-1883 Zin.Rz-7 amino stab2	$c_s c_s c_s a_s$agg GccgaaagG***C***GaGugaGGu***C***u acagcuu **B**	6582
2311	CCAAAU G CCCCUA	6233	20163	HBV-2311 Zin.Rz-6 amino stab2	$u_s a_s g_s g_s$gg GccgaaagG***C***GaGugaGGu***C***u auuugg **B**	6583
2347	ACUGUU G UUAGAC	6234	20164	HBV-2347 Zin.Rz-6 amino stab2	$g_s u_s c_s u_s$aa GccgaaagG***C***GaGugaGGu***C***u aacagu **B**	6584
2364	AGGCAG G UCCCCU	6235	20165	HBV-2364 Zin.Rz-6 amino stab2	$a_s g_s g_s g_s$ga GccgaaagG***C***GaGugaGGu***C***u cugccu **B**	6585
2364	GAGGCAG G UCCCCUA	6236	20166	HBV-2364 Zin.Rz-7 amino stab2	$u_s a_s g_s g_s$gga GccgaaagG***C***GaGugaGGu***C***u cugccuc **B**	6586
2388	UCCCUC G CCUCGC	6237	20167	HBV-2388 Zin.Rz-6 amino stab2	$g_s c_s g_s a_s$gg GccgaaagG***C***GaGugaGGu***C***u gaggga **B**	6587
2393	CGCCUC G CAGACG	6238	20168	HBV-2393 Zin.Rz-6 amino stab2	$c_s g_s u_s c_s$ug GccgaaagG***C***GaGugaGGu***C***u gaggcg **B**	6588
2417	CGCCGC G UCGCAG	6239	20169	HBV-2417 Zin.Rz-6 amino stab2	$c_s u_s g_s c_s$ga GccgaaagG***C***GaGugaGGu***C***u gcggcg **B**	6589
2420	CGCGUC G CAGAAG	6240	20170	HBV-2420 Zin.Rz-6 amino stab2	$c_s u_s u_s c_s$ug GccgaaagG***C***GaGugaGGu***C***u gacgcg **B**	6590
2474	CAUAAG G UGGGAA	6241	20171	HBV-2474 Zin.Rz-6 amino stab2	$u_s u_s c_s c_s$ca GccgaaagG***C***GaGugaGGu***C***u cuuaug **B**	6591
381	GCUGGAU G UGUCUGC	6242	20172	HBV-381 Amb.Rz-7 stab2	$g_s c_s a_s g_s$aca gga L uc***CCUUC***aagga L uc***C***GGG auccagc **B**	6592
648	UAUGGGA G UGGGCCU	6243	20173	HBV-648 Amb.Rz-7 stab2	$a_s g_s g_s c_s$cca gga L uc***CCUUC***aagga L uc***C***GGG ucccaua **B**	6593
198	UGCUCGU G UUACAGG	6244	20174	HBV-198 Amb.Rz-7 stab2	$c_s c_s u_s g_s$uaa gga L uc***CCUUC***aagga L uc***C***GGG acgagca **B**	6594
377	UAUCGCU G GAUGUGU	6245	20175	HBV-377 Amb.Rz-7 stab2	$a_s c_s a_s c_s$auc gga L uc***CCUUC***aagga L uc***C***GGG agcgaua **B**	6595
378	AUCGCUG G AUGUGUC	6246	20176	HBV-378 Amb.Rz-7 stab2	$g_s a_s c_s a_s$cau gga L uc***CCUUC***aagga L uc***C***GGG cagcgau **B**	6596
383	UGGAUGU G UCUGCGG	6247	20177	HBV-383 Amb.Rz-7 stab2	$c_s c_s g_s c_s$aga gga L uc***CCUUC***aagga L uc***C***GGG acaucca **B**	6597
383	GGAUGU G UCUGCG	6248	20178	HBV-383 Amb.Rz-6 stab2	$c_s g_s c_s a_s$ga gga L uc***CCUUC***aagga L uc***C***GGG acaucc **B**	6598
648	AUGGGA G UGGGCC	6249	20179	HBV-648 Amb.Rz-6 stab2	$g_s g_s c_s c_s$ca gga L uc***CCUUC***aagga L uc***C***GGG ucccau **B**	6599
650	UGGGAGU G GGCCUCA	6250	20180	HBV-650 Amb.Rz-7 stab2	$u_s g_s a_s g_s$gcc gga L uc***CCUUC***aagga L uc***C***GGG acuccca **B**	6600

Table 43

650	GGGAGU G GGCCUC	6251	20181	HBV-650 Amb.Rz-6 stab2	$g_sa_sg_sg_s$cc gga L uc*CCUUC*aagga L ucCGGG acuccc **B**	6601
694	GCCAUUU G UUCAGUG	6252	20182	HBV-694 Amb.Rz-7 stab2	$c_sa_sc_su_s$gaa gga L uc*CCUUC*aagga L ucCGGG aaauggc **B**	6602
699	UUGUUCA G UGGUUCG	6253	20183	HBV-699 Amb.Rz-7 stab2	$c_sg_sa_sa_s$cca gga L uc*CCUUC*aagga L ucCGGG ugaacaa **B**	6603
701	GUUCAGU G GUUCGUA	6254	20184	HBV-701 Amb.Rz-7 stab2	$u_sa_sc_sg_s$aac gga L uc*CCUUC*aagga L ucCGGG acugaac **B**	6604
710	UUCGUAG G GCUUUCC	6255	20185	HBV-710 Amb.Rz-7 stab2	$g_sg_sa_sa_s$agc gga L uc*CCUUC*aagga L ucCGGG cuacgaa **B**	6605
1525	CCACGG G GCGCAC	6256	20186	HBV-1525 Amb.Rz-6 stab2	$g_su_sg_sc_s$gc gga L uc*CCUUC*aagga L ucCGGG ccgugg **B**	6606
1624	CACCGU G AACGCC	6257	20187	HBV-1624 Amb.Rz-6 stab2	$g_sg_sc_sg_s$uu gga L uc*CCUUC*aagga L ucCGGG acggug **B**	6607
2069	CACUCA G GCAAGC	6258	20188	HBV-2069 Amb.Rz-6 stab2	$g_sc_su_su_s$gc gga L uc*CCUUC*aagga L ucCGGG ugagug **B**	6608
2375	CCUAGAA G AAGAACU	6259	20189	HBV-2375 Amb.Rz-7 stab2	$a_sg_su_su_s$cuu gga L uc*CCUUC*aagga L ucCGGG uucuagg **B**	6609
2476	AUAAGGU G GGAAACU	6260	20190	HBV-2476 Amb.Rz-7 stab2	$a_sg_su_su_s$ucc gga L uc*CCUUC*aagga L ucCGGG accuuau **B**	6610
65	CCUGCUG G UGGCUCC	6261	20191	HBV-65 Amb.Rz-7 stab2	$g_sg_sa_sg_s$cca gga L uc*CCUUC*aagga L ucCGGG cagcagg **B**	6611
67	GCUGGU G GCUCCA	6262	20192	HBV-67 Amb.Rz-6 stab2	$u_sg_sg_sa_s$gc gga L uc*CCUUC*aagga L ucCGGG accagc **B**	6612
198	GCUCGU G UUACAG	6263	20193	HBV-198 Amb.Rz-6 stab2	$c_su_sg_su_s$aa gga L uc*CCUUC*aagga L ucCGGG acgagc **B**	6613
260	GACUCGU G GUGGACU	6264	20194	HBV-260 Amb.Rz-7 stab2	$a_sg_su_sc_s$cac gga L uc*CCUUC*aagga L ucCGGG acgaguc **B**	6614
263	UCGUGGU G GACUUCU	6265	20195	HBV-263 Amb.Rz-7 stab2	$a_sg_sa_sa_s$guc gga L uc*CCUUC*aagga L ucCGGG accacga **B**	6615
377	AUCGCU G GAUGUG	6266	20196	HBV-377 Amb.Rz-6 stab2	$c_sa_sc_sa_s$uc gga L uc*CCUUC*aagga L ucCGGG agcgau **B**	6616
378	UCGCUG G AUGUGU	6267	20197	HBV-378 Amb.Rz-6 stab2	$a_sc_sa_sc_s$au gga L uc*CCUUC*aagga L ucCGGG cagcga **B**	6617
476	CCGUUU G UCCUCU	6268	20198	HBV-476 Amb.Rz-6 stab2	$a_sg_sa_sg_s$ga gga L uc*CCUUC*aagga L ucCGGG aaacgg **B**	6618
651	GGGAGUG G GCCUCAG	6269	20199	HBV-651 Amb.Rz-7 stab2	$c_su_sg_sa_s$ggc gga L uc*CCUUC*aagga L ucCGGG cacuccc **B**	6619
677	UGGCUCA G UUUACUA	6270	20200	HBV-677 Amb.Rz-7 stab2	$u_sa_sg_su_s$aaa gga L uc*CCUUC*aagga L ucCGGG ugagcca **B**	6620
685	UUUACUA G UGCCAUU	6271	20201	HBV-685 Amb.Rz-7 stab2	$a_sa_su_sg_s$gca gga L uc*CCUUC*aagga L ucCGGG uaguaaa **B**	6621
702	UUCAGUG G UUCGUAG	6272	20202	HBV-702 Amb.Rz-7 stab2	$c_su_sa_sc_s$gaa gga L uc*CCUUC*aagga L ucCGGG cacugaa **B**	6622
709	GUUCGUA G GGCUUUC	6273	20203	HBV-709 Amb.Rz-7 stab2	$g_sa_sa_sa_s$gcc gga L uc*CCUUC*aagga L ucCGGG uacgaac **B**	6623
710	UCGUAG G GCUUUC	6274	20204	HBV-710 Amb.Rz-6 stab2	$g_sa_sa_sa_s$gc gga L uc*CCUUC*aagga L ucCGGG cuacga **B**	6624
747	UAUGGAU G AUGUGGU	6275	20205	HBV-747 Amb.Rz-7 stab2	$a_sc_sc_sa_s$cau gga L uc*CCUUC*aagga L ucCGGG auccaua **B**	6625
1557	CCGUCU G UGCCUU	6276	20206	HBV-1557 Amb.Rz-6 stab2	$a_sa_sg_sg_s$ca gga L uc*CCUUC*aagga L ucCGGG agacgg **B**	6626
1881	CCAAGCU G UGCCUUG	6277	20207	HBV-1881 Amb.Rz-7 stab2	$c_sa_sa_sg_s$gca gga L uc*CCUUC*aagga L ucCGGG agcuugg **B**	6627
2347	ACUGUU G UUAGAC	6278	20208	HBV-2347 Amb.Rz-6 stab2	$g_su_sc_su_s$aa gga L uc*CCUUC*aagga L ucCGGG aacagu **B**	6628
2375	CUAGAA G AAGAAC	6279	20209	HBV-2375 Amb.Rz-6 stab2	$g_su_su_sc_s$uu gga L uc*CCUUC*aagga L ucCGGG uucuag **B**	6629
2378	GAAGAA G AACUCC	6280	20210	HBV-2378 Amb.Rz-6 stab2	$g_sg_sa_sg_s$uu gga L uc*CCUUC*aagga L ucCGGG uucuuc **B**	6630
2423	CGUCGCA G AAGAUCU	6281	20211	HBV-2423 Amb.Rz-7 stab2	$a_sg_sa_su_s$cuu gga L uc*CCUUC*aagga L ucCGGG ugcgacg **B**	6631

Table 43

2426	GCAGAA G AUCUCA	6282	20212	HBV-2426 Amb.Rz-6 stab2	$u_s g_s a_s g_s$au gga L uc***CCUUC***aagga L uc***C***GGG uucugc **B**	6632
2426	CGCAGAA G AUCUCAA	6283	20213	HBV-2426 Amb.Rz-7 stab2	$u_s u_s g_s a_s$gau gga L uc***CCUUC***aagga L uc***C***GGG uucugcg **B**	6633
2476	UAAGGU G GGAAAC	6284	20214	HBV-2476 Amb.Rz-6 stab2	$g_s u_s u_s u_s$cc gga L uc***CCUUC***aagga L uc***C***GGG accuua **B**	6634
2477	UAAGGUG G GAAACUU	6285	20215	HBV-2477 Amb.Rz-7 stab2	$a_s a_s g_s u_s$uuc gga L uc***CCUUC***aagga L uc***C***GGG caccuua **B**	6635
2477	AAGGUG G GAAACU	6286	20216	HBV-2477 Amb.Rz-6 stab2	$a_s g_s u_s u_s$uc gga L uc***CCUUC***aagga L uc***C***GGG caccuu **B**	6636
1607	UGCACGU C GCAUGGA	6287	20697	HBV-1607 Rz-7 allyl stab1 (7/4)	$u_s c_s c_s a_s$ugc c**U**GAuGaggccguuaggccGaa Acgugca **B**	6637
1887	GUGCCU U GGGUGG	6288	20698	HBV-1887 Rz-6 allyl stab1 (6/4)	$c_s c_s a_s c_s$cc c**U**GAuGaggccguuaggccGaa Aggcac **B**	6638
1607	GCACGU C GCAUGG	6289	20699	HBV-1607 Rz-6 allyl stab1 (6/3)	$c_s c_s a_s u_s$gc c**U**GAuGaggcguuagccGaa Acgugc **B**	6639
1607	UGCACGU C GCAUGGA	6290	20700	HBV-1607 Rz-7 allyl stab1 (7/3)	$u_s c_s c_s a_s$ugc c**U**GAuGaggcguuagccGaa Acgugca **B**	6640
1887	GUGCCU U GGGUGG	6291	20701	HBV-1887 Rz-6 allyl stab1 (6/3)	$c_s c_s a_s c_s$cc c**U**GAuGaggcguuagccGaa Aggcac **B**	6641
1887	UGUGCCU U GGGUGGC	6292	20702	HBV-1887 Rz-7 allyl stab1 (7/3)	$g_s c_s c_s a_s$ccc c**U**GAuGaggcguuagccGaa Aggcaca **B**	6642

UPPER CASE = RIBO
lower case = 2'-O-methyl
s = phosphorothioate linkage
B = inverted deoxyabasic residue
U = 2'-deoxy-2'-C-allyl Uridine
U = 2'-deoxy-2'-amino Uridine
C = 2'-deoxy-2'-amino Cytidine

Table 44

Table 44: Group Designation and Dosage levels for HBV transgenic mouse study

Group	Compound	Dose	Number of Mice	Duration of Treatment
1	RPI.18341 (site 273)	100 mg/kg/day*	10F	14 days
2	RPI.18371 (site 1833)	100 mg/kg/day*	10F	14 days
3	RPI.18418 (site 1873)	100 mg/kg/day*	10F	14 days
4	RPI.18372 (site 1874)	100 mg/kg/day*	10F	14 days
5	Saline control	100 mg/kg/day*	10F	14 days
6	Untreated		10F	0 days

*administered via sc infusion using Alzet mini-osmotic pumps

Table 45

TABLE 45. NUCLEOSIDES USED FOR CHEMICAL SYNTHESIS OF MODIFIED NUCLEOTIDE TRIPHOSPHATES

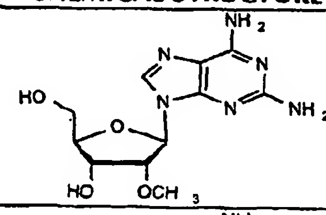
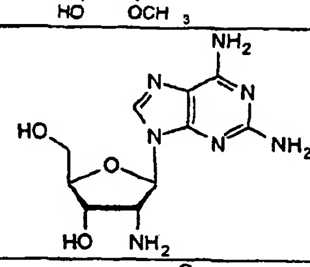
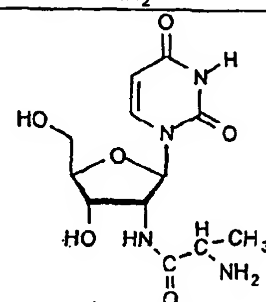
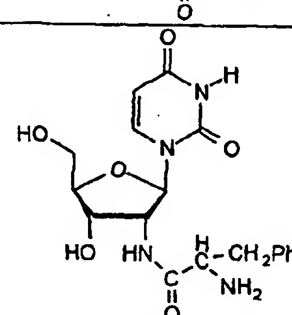
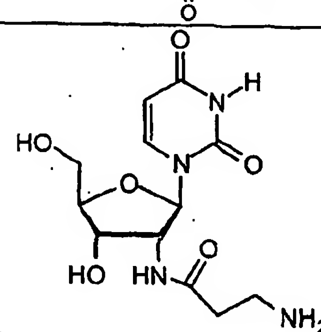
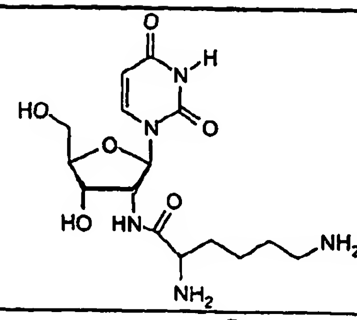
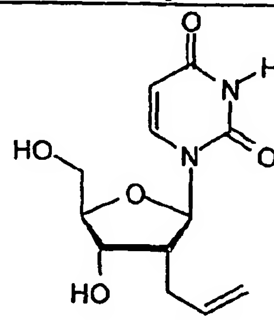
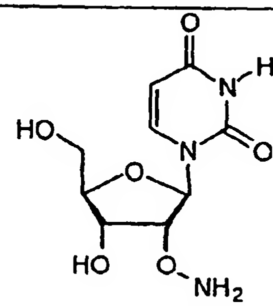
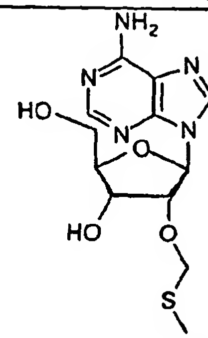
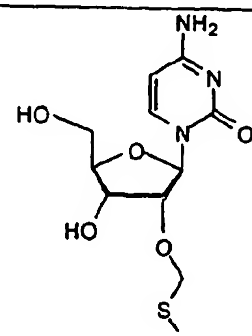
	NUCLEOSIDES	Abbreviation	CHEMICAL STRUCTURE
1	2'-O-methyl-2,6-diaminopurine riboside	2'-O-Me-DAP	
2	2'-deoxy-2'amino-2,6-diaminopurine riboside	2'-NH$_2$-DAP	
3	2'-(N-alanyl)amino-2'-deoxy-uridine	ala-2'- NH$_2$ U	
4	2'-(N-phenylalanyl)amino-2'-deoxy-uridine	phe-2'- NH$_2$-U	
5	2'-(N-β-alanyl) amino-2'-deoxy uridine	2'–β-Ala-NH$_2$-U	

Table 45

6	2'-Deoxy-2'-(lysiyl) amino uridine	2'-L-lys-NH_2-U	
7	2'-C-allyl uridine	2'-C-allyl-U	
8	2'-O-amino-uridine	2'-O-NH_2-U	
9	2'-O-methylthiomethyl adenosine	2'-O-MTM-A	
10	2'-O-methylthiomethyl cytidine	2'-O-MTM-C	

600

Table 45

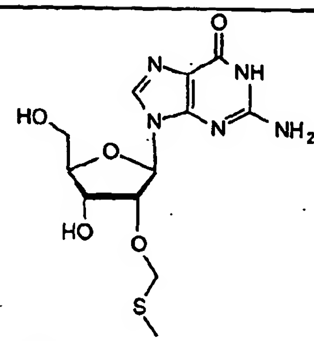
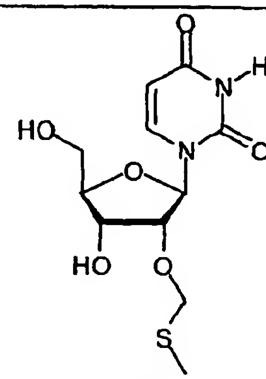
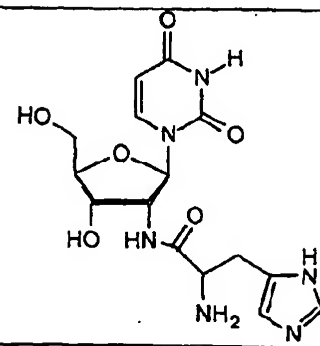
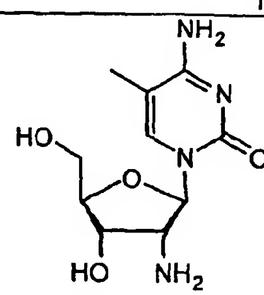
11	2'-O-methylthiomethyl guanosine	2'-O-MTM-G	
12	2'-O-methylthiomethyl-uridine	2'-O-MTM-U	
13	2'-(N-histidyl) amino uridine	2'-his-NH_2-U	
14	2'-Deoxy-2'-amino-5-methyl cytidine	5-Me-2'-NH_2-C	

Table 45

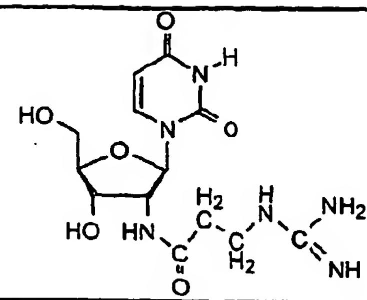
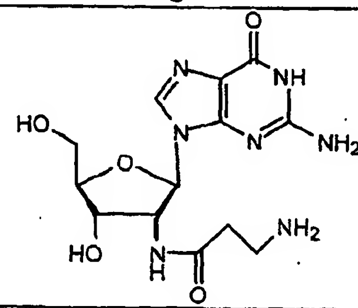
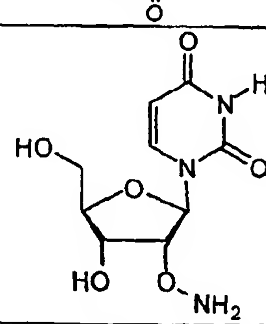
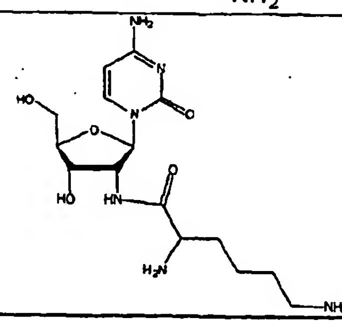
15	2′-(*N*-β-carboxamidine-β-alanyl)amino-2′-deoxy-uridine	β-ala-CA-NH2-U	
16	.2′-(*N*-β-alanyl) guanosine	β-Ala-NH_2-G	
17	2′-O-Amino-Uridine	2′-O-NH_2-U	
18	2'-(*N*-lysyl)amino -2′-deoxy-cytidine	2′- NH_2-lys-C	

Table 45

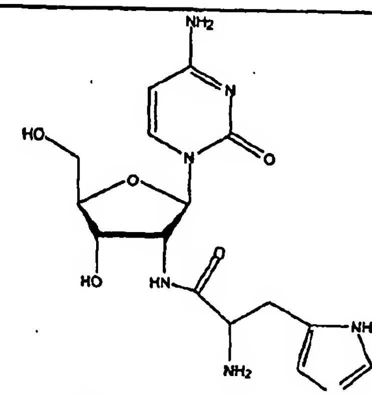
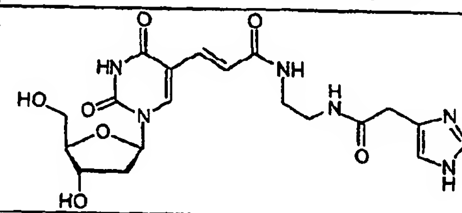
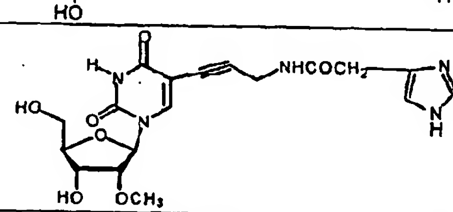
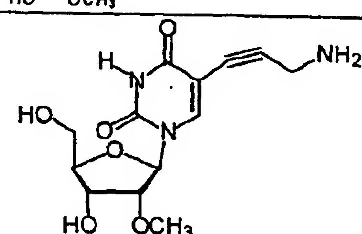
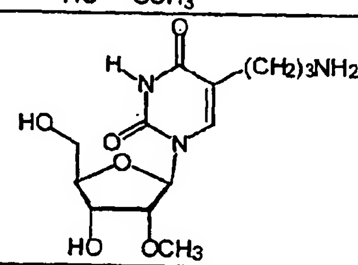
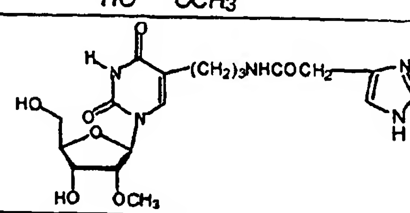
19	2'-Deoxy -2'-(L-histidine) amino Cytidine	2'- NH_2-his-C	
20	5-Imidazoleacetic acid 2'-deoxy uridine	5-IAA-U	
21	5-[3-(N-4-imidazoleacetyl)amino propynyl]-2'-O-methyl uridine	5-IAA-propynylamino-2'-OMe U	
22	5-(3-aminopropynyl)-2'-O-methyl uridine	5-aminopropynyl-2'-OMe U	
23	5-(3-aminopropyl)-2'-O-methyl uridine	5-aminopropyl-2'-OMe U	
24	5-[3-(N-4-imidazoleacetyl)amino propyl]-2'-O-methyl Uridine	5-IAA-propylamino-2'-OMe U	

Table 45

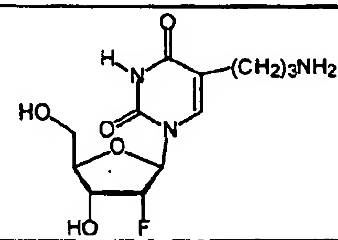
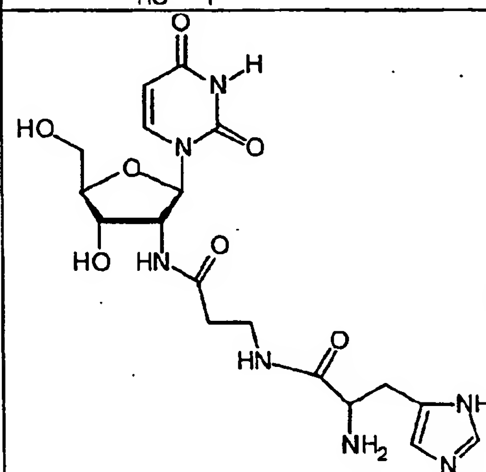
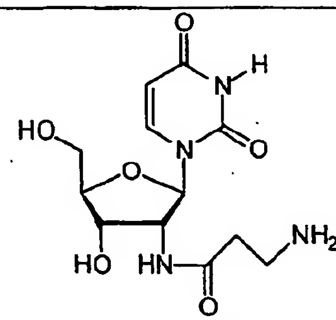
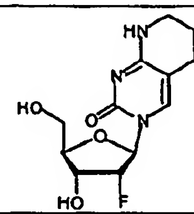
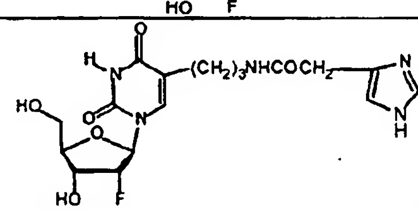
25	5-(3-aminopropyl)-2′-deoxy-2-fluoro uridine	5-aminopropyl-2′-F dU	
26	2′-Deoxy-2′-(β-alanyl-L-histidyl)amino Uridine	2′-amino-β-ALA-HIS dU	
27	2′-deoxy-2′-β-alaninamido-uridine	2′-β-ALA dU	
28	3-(2′-deoxy-2′-fluoro-β-D-ribofuranosyl)piperazino[2,3-D]pyrimidine-2-one	2′-F piperazino-pyrimidinone	
29	5-[3-(N-4-imidazoleacetyl)amino propyl]-2′-deoxy-2′-fluoro Uridine	5-IAA-propylamino-2′-F dU	

Table 45

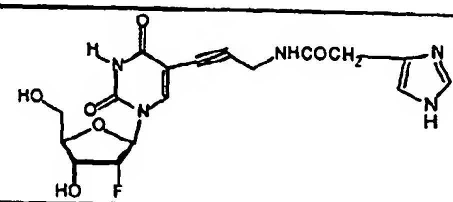
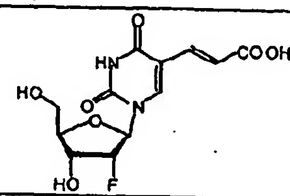
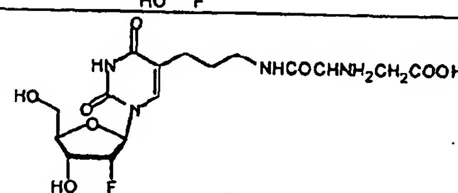
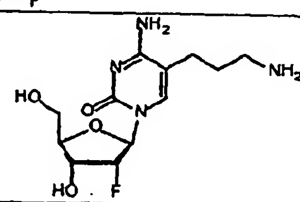
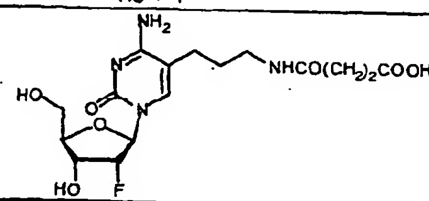
30	5-[3-(N-4-imidazoleacetyl)amino propynyl]-2'-deoxy-2'-fluoro uridine	5-IAA-propynylamino-2'-F dU	
31	5-E-(2-carboxyvinyl-2'-deoxy-2'-fluoro uridine	5-carboxyvinyl-2'-F dU	
32	5-[3-(N-4-aspartyl)aminopropynyl-2'-fluoro uridine	5-ASP-aminopropyl-2'-F-dU	
33	5-(3-aminopropyl)-2'-deoxy-2-fluoro cytidine	5-aminopropyl-2'-F dC	
34	5-[3-(N-4-succynyl)aminopropyl-2'-deoxy-2-fluoro cytidine	5-succynylamino-propyl-2'-F dC	

Table 46

Table 46: PHOSPHORYLATION OF URIDINE IN THE PRESENCE OF DMAP

0 equiv. DMAP		0.2 equiv. DMAP		0.5 equiv. DMAP		1.0 equiv. DMAP	
Time (min)	Product %	Time (min)	Product %	Time (min)	Product %	Time (min)	Product %
0	1	0	0	0	0	0	0
40	7	10	8	20	27	30	74
80	10	50	24	60	46	70	77
120	12	90	33	100	57	**110**	**84**
160	14	130	39	140	63	150	83
200	17	170	43	180	63	190	84
240	19	210	47	220	64	230	77
320	20	250	48	260	68	270	79
1130	**48**	290	49	300	64	310	77
1200	46	1140	68	1150	76	1160	72
		1210	69	1220	76	1230	74

Table 47

Table 47: Detailed Description of the NTP Incorporation Reaction Conditions

Condition No.	TRIS-HCL (mM)	$MgCl_2$ (mM)	DTT (mM)	Spermidine (mM)	Triton X-100 (%)	METHANOL (%)	LiCl (mM)	PEG (%)	Temp(°C)
1	40 (pH 8.0)	20	10	5	0.01	10	1	-	25
2	40 (pH 8.0)	20	10	5	0.01	10	1	4	25
3	40 (pH 8.1)	12	5	1	0.002	-	-	4	25
4	40 (pH 8.1)	12	5	1	0.002	10	-	4	25
5	40 (pH 8.1)	12	5	1	0.002	-	1	4	25
6	40 (pH 8.1)	12	5	1	0.002	10	1	4	25
7	40 (pH 8.0)	20	10	5	0.01	10	1	-	37
8	40 (pH 8.0)	20	10	5	0.01	10	1	4	37
9	40 (pH 8.1)	12	5	1	0.002	-	-	4	37
10	40 (pH 8.1)	12	5	1	0.002	10	-	4	37
11	40 (pH 8.1)	12	5	1	0.002	-	1	4	37
12	40 (pH 8.1)	12	5	1	0.002	10	1	4	37

Table 48

Table 48: INCORPORATION OF MODIFIED NUCLEOTIDE TRIPHOSPHATES

Modification	COND# 1	COND# 2	COND# 3	COND# 4	COND# 5	COND# 6	COND# 7	COND# 8	COND# 9	COND# 10	COND# 11	COND# 12
2'-NH_2-ATP	1	2	3	5	2	4	1	2	10	11	5	9
2'- NH_2-CTP	11	37	45	64	25	70	26	54	292	264	109	244
2'- NH_2-GTP	4	7	6	14	5	17	3	16	10	21	9	16
2'- NH_2-UTP	14	45	4	100	85	82	48	88	20	418	429	440
2'-dATP	9	3	19	23	9	24	6	3	84	70	28	51
2'-dCTP	1	10	43	46	35	47	27	127	204	212	230	235
2'-dGTP	6	10	9	15	9	12	8	34	38	122	31	46
2'-dTTP	9	9	14	18	13	18	8	15	116	114	59	130
2'-*O*-Me-ATP	0	0	0	0	0	0	1	1	2	2	2	2
2'-*O*-Me-CTP	no data compared to ribo; incorporates at low level											
2'-*O*-Me-GTP	4	3	4	4	4	4	2	4	4	5	4	5
2'-*O*-Me-UTP	55	52	39	38	41	48	55	71	93	103	81	77
2'-*O*-Me-DAP	4	4	3	4	4	5	4	3	4	5	5	5
2'- NH_2-DAP	0	0	1	1	1	1	1	0	0	0	0	0
ala-2'-NH_2-UTP	2	2	2	2	3	4	14	18	15	20	13	14
phe-2'-NH_2-UTP	8	12	7	7	8	8	4	10	6	6	10	6
2'-ß NH_2-ala-UTP	65	48	25	17	21	21	220	223	265	300	275	248
2'-F-C5-carboxyvinyl UTP									100			
2'-F-C5-aspartyl-									100			

Table 48

aminopropyl UTP												
2'-F-C5-propylamine CTP									100			
2'-*O*-Me CTP									0			
2'-*O*-Me UTP									25			
2'-*O*-Me 5-3-aminopropyl UTP									4			
2'-*O*-Me 5-3-aminopropyl UTP									10			

Table 49

Table 49: INCORPORATION OF MODIFIED NUCLEOTIDE TRIPHOSPHATES USING WILD TYPE BACTERIOPHAGE T7 POLYMERASE

Modification	label	% ribo control
2'-NH_2-GTP	ATP	4%
2'-dGTP	ATP	3%
2'-O-Me-GTP	ATP	3%
2'-F-GTP	ATP	4%
2'-O-MTM-GTP	ATP	3%
2'-NH_2-UTP	ATP	39%
2'-dTTP	ATP	5%
2'-O-Me-UTP	ATP	3%
ala-2'-NH_2-UTP	ATP	2%
phe-2'-NH_2- UTP	ATP	1%
2'-β-ala-NH_2-UTP	ATP	3%
2'-C-allyl-UTP	ATP	2%
2'-O-NH_2-UTP	ATP	1%
2'-O-MTM-UTP	ATP	64%
2'-NH_2-ATP	GTP	1%
2'-O-MTM-ATP	GTP	1%
2'-NH_2-CTP	GTP	59%
2'-dCTP	GTP	40%
2'-F-CTP	GTP	100%
2'-F-UTP	GTP	100%
2'-F-TTP	GTP	0%
2'-F-C5-carboxyvinyl UTP	GTP	100%
2'-F-C5-aspartyl-aminopropyl UTP	GTP	100%
2'-F-C5-propylamine CTP	GTP	100%
2'-O-Me CTP	GTP	0%
2'-O-Me UTP	GTP	0%
2'-O-Me 5-3-aminopropyl UTP	GTP	0%
2'-O-Me 5-3-aminopropyl UTP	GTP	0%

Table 50

Table 50 a: Incorporation of 2'-his-UTP and Modified CTP's

modification	2'-his-UTP	rUTP
CTP	16.1	100
2'-amino-CTP	**9.5***	232.7
2'-deoxy-CTP	**9.6***	130.1
2'-OMe-CTP	1.9	6.2
2'-MTM-CTP	5.9	5.1
control	1.2	

Table 50 b: Incorporation of 2'-his-UTP, 2-amino CTP, and Modified ATP's

modification	2'-his-UTP and 2'-amino-CTP	rUTP and rCTP
ATP	15.7	100
2'-amino-ATP	2.4	28.9
2'-deoxy-ATP	2.3	146.3
2'-OMe-ATP	2.7	15
2'-F-ATP	4	222.6
2'-MTM-ATP	4.7	15.3
2'-OMe-DAP	1.9	5.7
2'-amino-DAP	**8.9***	9.6

Numbers shown are a percentage of incorporation compared to the all-RNA control

* -Bold number indicates best observed rate of modified nucleotide triphosphate incorporation

Table 51

Table 51: INCORPORATION OF 2'-his-UTP, 2'-NH_2-CTP, 2'-NH_2-DAP, and rGTP USING VARIOUS REACTION CONDITIONS

Conditions	compared to all rNTP
7	8.7*
8	7*
9	2.3
10	2.7
11	1.6
12	2.5

Numbers shown are a percentage of incorporation compared to the all-RNA control

* Two highest levels of incorporation contained both methanol and LiCl

Table 52

Table 52: Selection of Oligonucleotides with Ribozyme Activity

pool	Generation	time	substrate remaining(%)	time	Substrate remaining (%)
N60	0	4 hr	100.00	24 hr	100.98
N60	14	4 hr	99.67	24 hr	97.51
N60	15	4 hr	98.76	24 hr	96.76
N60	16	4 hr	97.09	24 hr	96.60
N60	17	4 hr	79.50	24 hr	64.01
N40	0	4 hr	99.89	24 hr	99.78
N40	10	4 hr	99.74	24 hr	99.42
N40	11	4 hr	97.18	24 hr	90.38
N40	12	4 hr	61.64	24 hr	44.54
N40	13	4 hr	54.28	24 hr	36.46
N20	0	4 hr	99.18	24 hr	100.00
N20	11	4 hr	100.00	24 hr	100.00
N20	12	4 hr	99.51	24 hr	100.00
N20	13	4 hr	90.63	24 hr	84.89
N20	14	4 hr	91.16	24 hr	85.92
N60B	0	4 hr	100.00	24 hr	100.00
N60B	1	4 hr	100.00	24 hr	100.00
N60B	2	4 hr	100.00	24 hr	100.00
N60B	3	4 hr	100.00	24 hr	100.00
N60B	4	4 hr	99.24	24 hr	100.00
N60B	5	4 hr	97.81	24 hr	96.65
N60B	6	4 hr	89.95	24 hr	77.14

Table 53

Table 53: Kinetic Activity of Combinatorial Libraries

Pool	Generation	k_{obs} (min^{-1})
N60	17	0.0372
	18	0.0953
	19	0.0827
N40	12	0.0474
	13	0.037
	14	0.065
	15	0.0254
N20	13	0.0359
	14	0.0597
	15	0.0549
	16	0.0477
N60B	6	0.0209
	7	0.0715
	8	0.0379

Table 54

Table 54: Kinetic Activity of Clones within N60 and N40 Combinatorial Libraries

clone	library	activity(min^{-1})	k_{rel}
G18	N60	0.00226	1.00
0-2	N60	0.0389	17.21
0-3	N60	0.000609	0.27
0-5	N60	0.000673	0.30
0-7	N60	0.00104	0.46
0-8	N60	0.000739	0.33
0-11	N60	0.0106	4.69
0-12	N60	0.00224	0.99
0-13	N60	0.0255	11.28
0-14	N60	0.000878	0.39
0-15	N60	0.0000686	0.03
0-21	N60	0.0109	4.82
0-22	N60	0.000835	0.37
0-24	N60	0.000658	0.29
0-28	N40	0.000741	0.33
0-35	N40	0.00658	2.91
3-1	N40	0.0264	11.68
3-3	N40	0.000451	0.20
3-7	N40	0.000854	0.38
3-15	N40	0.000832	0.37

Table 55

Table 55: Effect of Magnesium Concentration of the Cleavage Rate of N20

$[Mg^{++}]$	$k_{obs}(min^{-1})$
25	0.0259
20	0.0223
15	0.0182
10	0.0208
5	0.0121
2	0.00319
2	0.00226

Table 56

Enzymatic Nucleic Acid Motifs Targeting HCV

	Seq ID	Alias	Sequence	Rz Seq ID
CUCC	1	HCV.R1A-6 Amb.Rz-10/5	ggagugucgc GgaggaaacucC CU UCAAGGACAUCGUCCGGG cccau B	39
GCGU	2	HCV.R1A-56 Amb.Rz-10/5	acgcuuucug GgaggaaacucC CU UCAAGGACAUCGUCCGGG gugaa B	40
GUAU	3	HCV.R1A-75 Amb.Rz-10/5	auacuaacgc GgaggaaacucC CU UCAAGGACAUCGUCCGGG auggc B	41
UAUG	4	HCV.R1A-76 Amb.Rz-10/5	cauacuaacg GgaggaaacucC CU UCAAGGACAUCGUCCGGG caugg B	42
CCAG	5	HCV.R1A-95 Amb.Rz-10/5	cuggaggcug GgaggaaacucC CU UCAAGGACAUCGUCCGGG acgac B	43
CGGU	6	HCV.R1A-138 Amb.Rz-10/5	accgguuccg GgaggaaacucC CU UCAAGGACAUCGUCCGGG agacc B	44
ACAC	7	HCV.R1A-146 Amb.Rz-10/5	guguacucac GgaggaaacucC CU UCAAGGACAUCGUCCGGG gguuc B	45
CCAG	8	HCV.R1A-158 Amb.Rz-10/5	cuggcaauuc GgaggaaacucC CU UCAAGGACAUCGUCCGGG ggugu B	46
CGAC	9	HCV.R1A-164 Amb.Rz-10/5	gucguccugg GgaggaaacucC CU UCAAGGACAUCGUCCGGG aauuc B	47
UUCU	10	HCV.R1A-176 Amb.Rz-10/5	agaaaggacc GgaggaaacucC CU UCAAGGACAUCGUCCGGG ggucg B	48
UCUU	11	HCV.R1A-177 Amb.Rz-10/5	aagaaaggac GgaggaaacucC CU UCAAGGACAUCGUCCGGG cgguc B	49
UGGG	12	HCV.R1A-209 Amb.Rz-10/5	cccaaaucuc GgaggaaacucC CU UCAAGGACAUCGUCCGGG aggca B	50
GAGU	13	HCV.R1A-237 Amb.Rz-10/5	acucggcuag GgaggaaacucC CU UCAAGGACAUCGUCCGGG agucu B	51
GAAA	14	HCV.R1A-254 Amb.Rz-10/5	uuucgcgacc GgaggaaacucC CU UCAAGGACAUCGUCCGGG aacac B	52
AAAG	15	HCV.R1A-255 Amb.Rz-10/5	cuuucgcgac GgaggaaacucC CU UCAAGGACAUCGUCCGGG caaca B	53
GCCU	16	HCV.R1A-259 Amb.Rz-10/5	aggccuuucg GgaggaaacucC CU UCAAGGACAUCGUCCGGG gaccc B	54
GGUA	17	HCV.R1A-266 Amb.Rz-10/5	uaccacaagg GgaggaaacucC CU UCAAGGACAUCGUCCGGG cuuuc B	55
CCUG	18	HCV.R1A-273 Amb.Rz-10/5	caggcaguac GgaggaaacucC CU UCAAGGACAUCGUCCGGG acaag B	56
GCGA	19	HCV.R1A-288 Amb.Rz-10/5	ucgcaagcac GgaggaaacucC CU UCAAGGACAUCGUCCGGG cuauc B	57
AGUG	20	HCV.R1A-291 Amb.Rz-10/5	cacucgcaag GgaggaaacucC CU UCAAGGACAUCGUCCGGG acccu B	58
UCCA	21	HCV.R1A-7 Amb.Rz-10/5	uggagugucg GgaggaaacucC CU UCAAGGACAUCGUCCGGG cccca B	59
CCAU	22	HCV.R1A-119 Amb.Rz-10/5	auggcucucc GgaggaaacucC CU UCAAGGACAUCGUCCGGG gggag B	60
CAUA	23	HCV.R1A-120 Amb.Rz-10/5	uauggcucuc GgaggaaacucC CU UCAAGGACAUCGUCCGGG cggga B	61
GGAA	24	HCV.R1A-133 Amb.Rz-10/5	uuccgcagac GgaggaaacucC CU UCAAGGACAUCGUCCGGG acuau B	62
GUGA	25	HCV.R1A-140 Amb.Rz-10/5	ucaccgguuc GgaggaaacucC CU UCAAGGACAUCGUCCGGG gcaga B	63
CCCG	26	HCV.R1A-188 Amb.Rz-10/5	cggggguuauc GgaggaaacucC CU UCAAGGACAUCGUCCGGG aagaa B	64
GCCU	27	HCV.R1A-198 Amb.Rz-10/5	aggcauugag GgaggaaacucC CU UCAAGGACAUCGUCCGGG ggggu B	65
GAUU	28	HCV.R1A-205 Amb.Rz-10/5	aaucuccagg GgaggaaacucC CU UCAAGGACAUCGUCCGGG auuga B	66
CCCC	29	HCV.R1A-217 Amb.Rz-10/5	ggggcacgcc GgaggaaacucC CU UCAAGGACAUCGUCCGGG aaauc B	67
CCCC	30	HCV.R1A-218 Amb.Rz-10/5	gggggcacgc GgaggaaacucC CU UCAAGGACAUCGUCCGGG caaau B	68
CCCG	31	HCV.R1A-219 Amb.Rz-10/5	cgggggcacg GgaggaaacucC CU UCAAGGACAUCGUCCGGG ccaaa B	69
CAAG	32	HCV.R1A-223 Amb.Rz-10/5	cuugcggggg GgaggaaacucC CU UCAAGGACAUCGUCCGGG acgcc B	70
UGCU	33	HCV.R1A-229 Amb.Rz-10/5	agcagucuug GgaggaaacucC CU UCAAGGACAUCGUCCGGG ggggg B	71
AGGG	34	HCV.R1A-279 Amb.Rz-10/5	cccuaucagg GgaggaaacucC CU UCAAGGACAUCGUCCGGG aguac B	72

Table 56

295	UGCUUGCGAGUGCCCC	35	HCV.R1A-295 Amb.Rz-10/5	ggggcacucg GgaggaaacucC CU UCAAGGACAUCGUCCGGG aagca B	73
301	CGAGUGCCCCGGGAGG	36	HCV.R1A-301 Amb.Rz-10/5	ccucccgggg GgaggaaacucC CU UCAAGGACAUCGUCCGGG acucg B	74
306	GCCCCGGGAGGUCUCG	37	HCV.R1A-306 Amb.Rz-10/5	cgagaccucc GgaggaaacucC CU UCAAGGACAUCGUCCGGG ggggc B	75
307	CCCCGGGAGGUCUCGU	38	HCV.R1A-307 Amb.Rz-10/5	acgagaccuc GgaggaaacucC CU UCAAGGACAUCGUCCGGG cgggg B	76
No Ribo				GgaaaggugugcaaccggagucaucauaauggcuucCCUUCaaggaCaUCgCCg ggacggcB	
Ribo				GGAAAGGUGUGCAACCGGAGUCAUCAUAAUGGCUCCCUUCAAGGACAUCGUCCGGG ACGGCB	

lower case = 2'-O-methyl
U, C = 2'-deoxy-2'-amino U, = 2'-deoxy-2'-amino C
G,A = ribo G, A
B = inverted deoxyabasic

Table 57

Table 57. Additional Class II enzymatic nucleic acid Motifs

Class II Motif ID	Sequence	Seq ID No.	Kinetic Rate
A2	GGGAGGAGGAAGUGCCUGGUCAGUCACACCGAGACUGGCAGACGCUGAAACC GCCGCGCUCGCUCCCAGUCC	77	UNK
A12	GGGAGGAGGAAGUGCCUGGUAGUAAUAUAAUCGUUACUACGAGUGCAAGGUC GCCGCGCUCGCUCCCAGUCC	78	UNK
A11	GGGAGGAGGAAGUGCCUGGUAGUUGCCCGAACUGUGACUACGAGUGAGGUC GCCGCGCUCGCUCCCAGUCC	79	UNK
B14	GGGAGGAGGAAGUGCCUGGCGAUCAGAUGAGAUGAUGGCAGACGCAGAGACC GCCGCGCUCGCUCCCAGUCC	80	UNK
B10	GGGAGGAGGAAGUGCCUGGCGACUGAUACGAAAAGUCGCAGUUUCGAAACC GCCGCGCUCGCUCCCAGUCC	81	UNK
B21	GGGAGGAGGAAGUGCCUGGCGACUGAUACGAAAAGUCGCAGGUUUCGAAACC GCCGCGCUCGCUCCCAGUCC	82	UNK
B7	GGGAGGAGGAAGUGCCUUGGCUCAGCAUAAGUGAGCAGAUUGCGACACC GCCGCGCUCGCUCCCAGUCC	83	UNK
C8	GGGAGGAGGAAGUGCCUUGGUCAUUAGGAUGACAAACGUAUACUGAACACU GCCGCGCUCGCUCCCAGUCC	84	0.01 MIN^{-1}

Table 58

Table 58: Human Her2 Class II Ribozyme and Target Sequen

RPI#	NT Pos	Substrate	Seq ID #	Ribozyme Alias	Ribozyme Sequence	Seq ID #
18722	180	CAUGGA G CUGGCG	85	erbB2-180 Zin.Rz-6 amino stabl	$c_sg_sc_sc_s$ag GccgaaagGCGaGucaaGGuCu uccaug B	194
18835	184	GAGCUG G CGGCCU	86	erbB2-184 Zin.Rz-6 amino stabl	$a_sg_sg_sc_s$cg GccgaaagGCGaGucaaGGuCu cagcuc B	195
18828	276	AGCUGCG G CUCCCUG	87	erbB2-276 Zin.Rz-7 amino stabl	$c_sa_sg_sg_s$gag GccgaaagGCGaGucaaGGuCu cgcagcu B	196
18653	314	UGCUCC G CCACCU	88	erbB2-314 Zin.Rz-6 amino stabl	$a_sg_sg_su_s$gg GccgaaagGCGaGucaaGGuCu ggagca B	197
18825	314	AUGCUCC G CCACCUC	89	erbB2-314 Zin.Rz-7 amino stabl	$g_sa_sg_sg_s$ugg GccgaaagGCGaGucaaGGuCu ggagcau B	198
18831	379	ACCAAU G CCAGCC	90	erbB2-379 Zin.Rz-6 amino stabl	$g_sg_sc_su_s$gg GccgaaagGCGaGucaaGGuCu auuggu B	199
18680	433	GCUCAUC G CUCACAA	91	erbB2-433 Zin.Rz-7 amino stabl	$u_su_sg_su_s$gag GccgaaagGCGaGucaaGGuCu gaugagc B	200
18711	594	GGAGCU G CAGCUU	92	erbB2-594 Zin.Rz-6 amino stabl	$a_sa_sg_sc_s$ug GccgaaagGCGaGucaaGGuCu agcucc B	201
18681	594	GGGAGCU G CAGCUUC	93	erbB2-594 Zin.Rz-7 amino stabl	$g_sa_sa_sg_s$cug GccgaaagGCGaGucaaGGuCu agcuccc B	202
18697	597	GCUGCA G CUUCGA	94	erbB2-597 Zin.Rz-6 amino stabl	$u_sc_sg_sa_s$ag GccgaaagGCGaGucaaGGuCu ugcagc B	203
18665	597	AGCUGCA G CUUCGAA	95	erbB2-597 Zin.Rz-7 amino stabl	$u_su_sc_sg_s$aag GccgaaagGCGaGucaaGGuCu ugcagcu B	204
18712	659	AGCUCU G CUACCA	96	erbB2-659 Zin.Rz-6 amino stabl	$u_sg_sg_su_s$ag GccgaaagGCGaGucaaGGuCu agagcu B	205
18682	659	CAGCUCU G CUACCAG	97	erbB2-659 Zin.Rz-7 amino stabl	$c_su_sg_sg_s$uag GccgaaagGCGaGucaaGGuCu agagcug B	206
18683	878	CUGACU G CUGCCA	98	erbB2-878 Zin.Rz-6 amino stabl	$u_sg_sg_sc_s$ag GccgaaagGCGaGucaaGGuCu agucag B	207
18654	878	ACUGACU G CUGCCAU	99	erbB2-878 Zin.Rz-7 amino stabl	$a_su_sg_sg_s$cag GccgaaagGCGaGucaaGGuCu agucagu B	208
18685	881	ACUGCU G CCAUGA	100	erbB2-881 Zin.Rz-6 amino stabl	$u_sc_sa_su_s$gg GccgaaagGCGaGucaaGGuCu agcagu B	209
18684	881	GACUGCU G CCAUGAG	101	erbB2-881 Zin.Rz-7 amino stabl	$c_su_sc_sa_s$ugg GccgaaagGCGaGucaaGGuCu agcaguc B	210
18723	888	GCCAUGA G CAGUGUG	102	erbB2-888 Zin.Rz-7 amino stabl	$c_sa_sc_sa_s$cug GccgaaagGCGaGucaaGGuCu ucauggc B	211
18686	929	CUGACU G CCUGGC	103	erbB2-929 Zin.Rz-6 amino stabl	$g_sc_sc_sa_s$gg GccgaaagGCGaGucaaGGuCu agucag B	212
18648	929	UCUGACU G CCUGGCC	104	erbB2-929 Zin.Rz-7 amino stabl	$g_sg_sc_sc_s$agg GccgaaagGCGaGucaaGGuCu agucaga B	213
18666	934	UGCCUG G CCUGCC	105	erbB2-934 Zin.Rz-6 amino stabl	$g_sg_sc_sa_s$gg GccgaaagGCGaGucaaGGuCu caggca B	214
18651	934	CUGCCUG G CCUGCCU	106	erbB2-934 Zin.Rz-7 amino stabl	$a_sg_sg_sc_s$agg GccgaaagGCGaGucaaGGuCu caggcag B	215
18655	938	UGGCCU G CCUCCA	107	erbB2-938 Zin.Rz-6 amino stabl	$u_sg_sg_sa_s$gg GccgaaagGCGaGucaaGGuCu aggcca B	216
18649	938	CUGGCCU G CCUCCAC	108	erbB2-938 Zin.Rz-7 amino stabl	$g_su_sg_sg_s$agg GccgaaagGCGaGucaaGGuCu aggccag B	217
18667	969	CUGUGA G CUGCAC	109	erbB2-969 Zin.Rz-6 amino stabl	$g_su_sg_sc_s$ag GccgaaagGCGaGucaaGGuCu ucacag B	218
18668	969	UCUGUGA G CUGCACU	110	erbB2-969 Zin.Rz-7 amino stabl	$a_sg_su_sg_s$cag GccgaaagGCGaGucaaGGuCu ucacaga B	219
18656	972	UGAGCU G CACUGC	111	erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug GccgaaagGCGaGucaaGGuCu agcuca B	220
18657	972	GUGAGCU G CACUGCC	112	erbB2-972 Zin.Rz-7 amino stabl	$g_sg_sc_sa_s$gug GccgaaagGCGaGucaaGGuCu agcucac B	221
19294	972			erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug GccaauuugugGCGaGucaaGGuCu agcuca B	222

Table 58

19295	972			erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug GccAAuuuGuGGCGaGucaaGGuCu agcuca B	223
19293	972			erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug GccgaaagGCGaGuGaGGuCu agcuca B	224
19292	972			erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug GccgaaagGCGaGuGaGGuCu agcuca B	225
19296	972			erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug GccacAAuuuGuGGcagGCGaGucaaGGuCu agcuca B	226
19727	972			erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug gccgaaaggCgagugagguCu agcuca B	227
19728	972			erbB2-972 Zin.Rz-6 amino stabl	$g_sc_sa_sg_s$ug gccgaaaggCgagugagGuCu agcuca B	228
18659	1199	GAGUGU G CUAUGG	113	erbB2-1199 Zin.Rz-6 amino stabl	$c_sc_sa_su_s$ag GccgaaagGCGaGucaaGGuCu acacuc B	229
18658	1199	CGAGUGU G CUAUGGU	114	erbB2-1199 Zin.Rz-7 amino stabl	$a_sc_sc_sa_s$uag GccgaaagGCGaGucaaGGuCu acacucg B	230
18724	1205	GCUAUG G UCUGGG	115	erbB2-1205 Zin.Rz-6 amino stabl	$c_sc_sc_sa_s$ga GccgaaagGCGaGucaaGGuCu cauagc B	231
18669	1205	UGCUAUG G UCUGGGC	116	erbB2-1205 Zin.Rz-7 amino stabl	$g_sc_sc_sc_s$aga GccgaaagGCGaGucaaGGuCu cauagca B	232
18725	1211	GUCUGG G CAUGGA	117	erbB2-1211 Zin.Rz-6 amino stabl	$u_sc_sc_sa_s$ug GccgaaagGCGaGucaaGGuCu ccagac B	233
18726	1292	UUGGGA G CCUGGC	118	erbB2-1292 Zin.Rz-6 amino stabl	$g_sc_sc_sa_s$gg GccgaaagGCGaGucaaGGuCu ucccaa B	234
18698	1292	UUUGGGA G CCUGGCA	119	erbB2-1292 Zin.Rz-7 amino stabl	$u_sg_sc_sc_s$agg GccgaaagGCGaGucaaGGuCu ucccaaa B	235
18727	1313	CCGGAGA G CUUUGAU	120	erbB2-1313 Zin.Rz-7 amino stabl	$a_su_sc_sa_s$aag GccgaaagGCGaGucaaGGuCu ucuccgg B	236
18699	1397	UCACAG G UUACCU	121	erbB2-1397 Zin.Rz-6 amino stabl	$a_sg_sg_su_s$aa GccgaaagGCGaGucaaGGuCu cuguga B	237
18728	1414	AUCUCA G CAUGGC	122	erbB2-1414 Zin.Rz-6 amino stabl	$g_sc_sc_sa_s$ug GccgaaagGCGaGucaaGGuCu ugagau B	238
18670	1414	CAUCUCA G CAUGGCC	123	erbB2-1414 Zin.Rz-7 amino stabl	$g_sg_sc_sc_s$aug GccgaaagGCGaGucaaGGuCu ugagaug B	239
18671	1536	GCUGGG G CUGCGC	124	erbB2-1536 Zin.Rz-6 amino stabl	$g_sc_sg_sc_s$ag GccgaaagGCGaGucaaGGuCu cccagc B	240
18687	1541	GGCUGC G CUCACU	125	erbB2-1541 Zin.Rz-6 amino stabl	$a_sg_su_sg_s$ag GccgaaagGCGaGucaaGGuCu gcagcc B	241
18829	1562	CUGGGCA G UGGACUG	126	erbB2-1562 Zin.Rz-7 amino stabl	$c_sa_sg_su_s$cca GccgaaagGCGaGucaaGGuCu ugcccag B	242
18830	1626	GGGACCA G CUCUUUC	127	erbB2-1626 Zin.Rz-7 amino stabl	$g_sa_sa_sa_s$gag GccgaaagGCGaGucaaGGuCu ugguccc B	243
18700	1755	CACCCA G UGUGUC	128	erbB2-1755 Zin.Rz-6 amino stabl	$g_sa_sc_sa_s$ca GccgaaagGCGaGucaaGGuCu ugggug B	244
18672	1755	CCACCCA G UGUGUCA	129	erbB2-1755 Zin.Rz-7 amino stabl	$u_sg_sa_sc_s$aca GccgaaagGCGaGucaaGGuCu uggguggB	245
18688	1757	CCCAGU G UGUCAA	130	erbB2-1757 Zin.Rz-6 amino stabl	$u_su_sg_sa_s$ca GccgaaagGCGaGucaaGGuCu acuggg B	246
18660	1757	ACCCAGU G UGUCAAC	131	erbB2-1757 Zin.Rz-7 amino stabl	$g_su_su_sg_s$aca GccgaaagGCGaGucaaGGuCu acugggu B	247
18689	1759	CAGUGU G UCAACU	132	erbB2-1759 Zin.Rz-6 amino stabl	$a_sg_su_su_s$ga GccgaaagGCGaGucaaGGuCu acacug B	248
18690	1759	CCAGUGU G UCAACUG	133	erbB2-1759 Zin.Rz-7 amino stabl	$c_sa_sg_su_s$uga GccgaaagGCGaGucaaGGuCu acacugg B	249
18701	1784	UUCGGG G CCAGGA	134	erbB2-1784 Zin.Rz-6 amino stabl	$u_sc_sc_su_s$gg GccgaaagGCGaGucaaGGuCu cccgaa B	250
18673	1784	CUUCGGG G CCAGGAG	135	erbB2-1784 Zin.Rz-7 amino stabl	$c_su_sc_sc_s$ugg GccgaaagGCGaGucaaGGuCu cccgaag B	251
18691	2063	UCAACU G CACCCA	136	erbB2-2063 Zin.Rz-6 amino stabl	$u_sg_sg_sg_s$ug GccgaaagGCGaGucaaGGuCu aguuga B	252
18661	2063	AUCAACU G CACCCAC	137	erbB2-2063 Zin.Rz-7 amino stabl	$g_su_sg_sg_s$gug GccgaaagGCGaGucaaGGuCu aguugau B	253

Table 58

18692	2075	ACUCCU G UGUGGA	138	erbB2-2075 Zin.Rz-6 amino stabl	$u_s c_s c_s a_s$ca GccgaaagGCGaGucaaGGuCu aggagu B	254
18729	2116	CAGAGA G CCAGCC	139	erbB2-2116 Zin.Rz-6 amino stabl	$g_s g_s c_s u_s$gg GccgaaagGCGaGucaaGGuCu ucucug B	255
18832	2247	GACUGCU G CAGGAAA	140	erbB2-2247 Zin.Rz-7 amino stabl	$u_s u_s u_s c_s$cug GccgaaagGCGaGucaaGGuCu agcaguc B	256
18833	2271	UGGAGCC G CUGACAC	141	erbB2-2271 Zin.Rz-7 amino stabl	$g_s u_s g_s u_s$cag GccgaaagGCGaGucaaGGuCu ggcucca B	257
18702	2341	AGGAAG G UGAAGG	142	erbB2-2341 Zin.Rz-6 amino stabl	$c_s c_s u_s u_s$ca GccgaaagGCGaGucaaGGuCu cuuccu B	258
18730	2347	GUGAAG G UGCUUG	143	erbB2-2347 Zin.Rz-6 amino stabl	$c_s a_s a_s g_s$ca GccgaaagGCGaGucaaGGuCu cuucac B	259
18674	2347	GGUGAAG G UGCUUGG	144	erbB2-2347 Zin.Rz-7 amino stabl	$c_s c_s a_s a_s$gca GccgaaagGCGaGucaaGGuCu cuucacc B	260
18713	2349	GAAGGU G CUUGGA	145	erbB2-2349 Zin.Rz-6 amino stabl	$u_s c_s c_s a_s$ag GccgaaagGCGaGucaaGGuCu accuuc B	261
18693	2349	UGAAGGU G CUUGGAU	146	erbB2-2349 Zin.Rz-7 amino stabl	$a_s u_s c_s c_s$aag GccgaaagGCGaGucaaGGuCu accuuca B	262
18731	2384	UACAAGG G CAUCUGG	147	erbB2-2384 Zin.Rz-7 amino stabl	$c_s c_s a_s g_s$aug GccgaaagGCGaGucaaGGuCu ccuugua B	263
18714	2410	GGAGAAU G UGAAAAU	148	erbB2-2410 Zin.Rz-7 amino stabl	$a_s u_s u_s u_s$uca GccgaaagGCGaGucaaGGuCu auucucc B	264
18732	2497	GUGAUG G CUGGUG	149	erbB2-2497 Zin.Rz-6 amino stabl	$c_s a_s c_s c_s$ag GccgaaagGCGaGucaaGGuCu caucac B	265
18703	2501	UGGCUG G UGUGGG	150	erbB2-2501 Zin.Rz-6 amino stabl	$c_s c_s c_s a_s$ca GccgaaagGCGaGucaaGGuCu cagcca B	266
18715	2540	GCAUCU G CCUGAC	151	erbB2-2540 Zin.Rz-6 amino stabl	$g_s u_s c_s a_s$gg GccgaaagGCGaGucaaGGuCu agaugc B	267
18733	2563	CAGCUG G UGACAC	152	erbB2-2563 Zin.Rz-6 amino stabl	$g_s u_s g_s u_s$ca GccgaaagGCGaGucaaGGuCu cagcug B	268
18734	2571	GACACA G CUUAUG	153	erbB2-2571 Zin.Rz-6 amino stabl	$c_s a_s u_s a_s$ag GccgaaagGCGaGucaaGGuCu uguguc B	269
18675	2571	UGACACA G CUUAUGC	154	erbB2-2571 Zin.Rz-7 amino stabl	$g_s c_s a_s u_s$aag GccgaaagGCGaGucaaGGuCu uguguca B	270
18716	2662	CAGAUU G CCAAGG	155	erbB2-2662 Zin.Rz-6 amino stabl	$c_s c_s u_s u_s$gg GccgaaagGCGaGucaaGGuCu aaucug B	271
18704	2675	GGAUGA G CUACCU	156	erbB2-2675 Zin.Rz-6 amino stabl	$a_s g_s g_s u_s$ag GccgaaagGCGaGucaaGGuCu ucaucc B	272
18676	2675	GGGAUGA G CUACCUG	157	erbB2-2675 Zin.Rz-7 amino stabl	$c_s a_s g_s g_s$uag GccgaaagGCGaGucaaGGuCu ucauccc B	273
18735	2738	GUCAAGA G UCCCAAC	158	erbB2-2738 Zin.Rz-7 amino stabl	$g_s u_s u_s g_s$gga GccgaaagGCGaGucaaGGuCu ucuugac B	274
18705	2773	GGGCUG G CUCGGC	159	erbB2-2773 Zin.Rz-6 amino stabl	$g_s c_s c_s g_s$ag GccgaaagGCGaGucaaGGuCu cagccc B	275
18836	2778	UGGCUCG G CUGCUGG	160	erbB2-2778 Zin.Rz-7 amino stabl	$c_s c_s a_s g_s$cag GccgaaagGCGaGucaaGGuCu cgagcca B	276
18694	2781	UCGGCU G CUGGAC	161	erbB2-2781 Zin.Rz-6 amino stabl	$g_s u_s c_s c_s$ag GccgaaagGCGaGucaaGGuCu agccga B	277
18662	2781	CUCGGCU G CUGGACA	162	erbB2-2781 Zin.Rz-7 amino stabl	$u_s g_s u_s c_s$cag GccgaaagGCGaGucaaGGuCu agccgag B	278
18737	2802	GACAGA G UACCAU	163	erbB2-2802 Zin.Rz-6 amino stabl	$a_s u_s g_s g_s$ua GccgaaagGCGaGucaaGGuCu ucuguc B	279
18736	2802	AGACAGA G UACCAUG	164	erbB2-2802 Zin.Rz-7 amino stabl	$c_s a_s u_s g_s$gua GccgaaagGCGaGucaaGGuCu ucugucu B	280
18717	2809	GUACCAU G CAGAUGG	165	erbB2-2809 Zin.Rz-7 amino stabl	$c_s c_s a_s u_s$cug GccgaaagGCGaGucaaGGuCu augguac B	281
18738	2819	AUGGGG G CAAGGU	166	erbB2-2819 Zin.Rz-6 amino stabl	$a_s c_s c_s u_s$ug GccgaaagGCGaGucaaGGuCu ccccau B	282
18706	2819	GAUGGGG G CAAGGUG	167	erbB2-2819 Zin.Rz-7 amino stabl	$c_s a_s c_s c_s$uug GccgaaagGCGaGucaaGGuCu ccccauc B	283
18695	2887	GAGUGAU G UGUGGAG	168	erbB2-2887 Zin.Rz-7 amino stabl	$c_s u_s c_s c_s$aca GccgaaagGCGaGucaaGGuCu aucacuc B	284

Table 58

18663	2908	GUGACU G UGUGGG	169	erbB2-2908 Zin.Rz-6 amino stabl	$c_sc_sc_sa_sca$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u agucac B	285
18826	2908	UGUGACU G UGUGGGA	170	erbB2-2908 Zin.Rz-7 amino stabl	$u_sc_sc_sc_saca$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u agucaca B	286
18664	2910	GACUGU G UGGGAG	171	erbB2-2910 Zin.Rz-6 amino stabl	$c_su_sc_sc_sca$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u acaguc B	287
18650	2910	UGACUGU G UGGGAGC	172	erbB2-2910 Zin.Rz-7 amino stabl	$g_sc_su_sc_scca$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u acaguca B	288
18677	2916	GUGGGA G CUGAUG	173	erbB2-2916 Zin.Rz-6 amino stabl	$c_sa_su_sc_sag$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u ucccac B	289
18652	2916	UGUGGGA G CUGAUGA	174	erbB2-2916 Zin.Rz-7 amino stabl	$u_sc_sa_su_scag$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u ucccaca B	290
18707	2932	UUUGGG G CCAAAC	175	erbB2-2932 Zin.Rz-6 amino stabl	$g_su_su_su_sgg$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u cccaaa B	291
18678	2932	UUUUGGG G CCAAACC	176	erbB2-2932 Zin.Rz-7 amino stabl	$g_sg_su_su_sugg$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u cccaaaa B	292
18719	3025	AUUGAU G UCUACA	177	erbB2-3025 Zin.Rz-6 amino stabl	$u_sg_su_sa_sga$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u aucaau B	293
18718	3025	CAUUGAU G UCUACAU	178	erbB2-3025 Zin.Rz-7 amino stabl	$a_su_sg_su_saga$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u aucaaug B	294
18720	3047	UCAAAU G UUGGAU	179	erbB2-3047 Zin.Rz-6 amino stabl	$a_su_sc_sc_saa$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u auuuga B	295
18696	3047	GUCAAAU G UUGGAUG	180	erbB2-3047 Zin.Rz-7 amino stabl	$c_sa_su_sc_scaa$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u auuugac B	296
18739	3087	CCGGGA G UUGGUG	181	erbB2-3087 Zin.Rz-6 amino stabl	$c_sa_sc_sc_saa$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u ucccgg B	297
18708	3087	UCCGGGA G UUGGUGU	182	erbB2-3087 Zin.Rz-7 amino stabl	$a_sc_sa_sc_scaa$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u ucccgga B	298
18740	3415	GAAGGG G CUGGCU	183	erbB2-3415 Zin.Rz-6 amino stabl	$a_sg_sc_sc_sag$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u cccuuc B	299
18741	3419	GGGCUG G CUCCGA	184	erbB2-3419 Zin.Rz-6 amino stabl	$u_sc_sg_sg_sag$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u cagccc B	300
18837	3419	GGGGCUG G CUCCGAU	185	erbB2-3419 Zin.Rz-7 amino stabl	$a_su_sc_sg_sgag$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u cagcccc B	301
18709	3437	UUGAUG G UGACCU	186	erbB2-3437 Zin.Rz-6 amino stabl	$a_sg_sg_su_sca$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u caucaa B	302
18679	3437	UUUGAUG G UGACCUG	187	erbB2-3437 Zin.Rz-7 amino stabl	$c_sa_sg_sg_suca$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u caucaaa B	303
18823	3504	UCUACA G CGGUAC	188	erbB2-3504 Zin.Rz-6 amino stabl	$g_su_sa_sc_scg$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u uguaga B	304
18710	3504	CUCUACA G CGGUACA	189	erbB2-3504 Zin.Rz-7 amino stabl	$u_sg_su_sa_sccg$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u uguagag B	305
18721	3724	CAAAGAC G UUUUUGC	190	erbB2-3724 Zin.Rz-7 amino stabl	$g_sc_sa_sa_saaa$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u gucuuug B	306
18834	3808	CCUCCU G CCUUCA	191	erbB2-3808 Zin.Rz-6 amino stabl	$u_sg_sa_sa_sgg$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u aggagg B	307
18827	3808	UCCUCCU G CCUUCAG	192	erbB2-3808 Zin.Rz-7 amino stabl	$c_su_sg_sa_sagg$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u aggagga B	308
18824	3996	GGGAAG G CCUGAC	193	erbB2-3996 Zin.Rz-6 amino stabl	$g_su_sc_sa_sgg$ GccgaaagG$\underline{C}$GaGucaaGGu$\underline{C}$u cuuccc B	309

UPPER CASE = RIBO
Lower case = 2'-O-methyl
$\underline{C}$ = 2'-deoxy-2'-amino Cytidine
s = phosphorothioate
B = inverted deoxyabasic

Table 59

Table 59: Human HER2 Class II (zinzyme) Ribozyme and Target Sequece

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
46	GGGCAGCC G CGCGCCCC	310	GGGGCGCG GCCGAAAGGCGAGUCAAGGUCU GGCUGCCC	895
48	GCAGCCGC G CGCCCCUU	311	AAGGGGCG GCCGAAAGGCGAGUCAAGGUCU GCGGCUGC	896
50	AGCCGCGC G CCCCUUCC	312	GGAAGGGG GCCGAAAGGCGAGUCAAGGUCU GCGCGGCU	897
75	CCUUUACU G CGCCGCGC	313	GCGCGGCG GCCGAAAGGCGAGUCAAGGUCU AGUAAAGG	898
77	UUUACUGC G CCGCGCGC	314	GCGCGCGG GCCGAAAGGCGAGUCAAGGUCU GCAGUAAA	899
80	ACUGCGCC G CGCGCCCG	315	CGGGCGCG GCCGAAAGGCGAGUCAAGGUCU GGCGCAGU	900
82	UGCGCCGC G CGCCCGGC	316	GCCGGGCG GCCGAAAGGCGAGUCAAGGUCU GCGGCGCA	901
84	CGCCGCGC G CCCGGCCC	317	GGGCCGGG GCCGAAAGGCGAGUCAAGGUCU GCGCGGCG	902
102	CACCCCUC G CAGCACCC	318	GGGUGCUG GCCGAAAGGCGAGUCAAGGUCU GAGGGGUG	903
112	AGCACCCC G CGCCCCGC	319	GCGGGGCG GCCGAAAGGCGAGUCAAGGUCU GGGGUGCU	904
114	CACCCCGC G CCCCGCGC	320	GCGCGGGG GCCGAAAGGCGAGUCAAGGUCU GCGGGGUG	905
119	CGCGCCCC G CGCCCUCC	321	GGAGGGCG GCCGAAAGGCGAGUCAAGGUCU GGGGCGCG	906
121	CGCCCCGC G CCCUCCCA	322	UGGGAGGG GCCGAAAGGCGAGUCAAGGUCU GCGGGGCG	907
163	CCGGAGCC G CAGUGAGC	323	GCUCACUG GCCGAAAGGCGAGUCAAGGUCU GGCUCCGG	908
194	GGCCUUGU G CCGCUGGG	324	CCCAGCGG GCCGAAAGGCGAGUCAAGGUCU ACAAGGCC	909
197	CUUGUGCC G CUGGGGGC	325	GCCCCCAG GCCGAAAGGCGAGUCAAGGUCU GGCACAAG	910
214	UCCUCCUC G CCCUCUUG	326	CAAGAGGG GCCGAAAGGCGAGUCAAGGUCU GAGGAGGA	911
222	GCCCUCUU G CCCCCCGG	327	CCGGGGGG GCCGAAAGGCGAGUCAAGGUCU AAGAGGGC	912
235	CCGGAGCC G CGAGCACC	328	GGUGCUCG GCCGAAAGGCGAGUCAAGGUCU GGCUCCGG	913
251	CCAAGUGU G CACCGGCA	329	UGCCGGUG GCCGAAAGGCGAGUCAAGGUCU ACACUUGG	914
273	AUGAAGCU G CGGCUCCC	330	GGGAGCCG GCCGAAAGGCGAGUCAAGGUCU AGCUUCAU	915
283	GGCUCCCU G CCAGUCCC	331	GGGACUGG GCCGAAAGGCGAGUCAAGGUCU AGGGAGCC	916
309	CUGGACAU G CUCCGCCA	332	UGGCGGAG GCCGAAAGGCGAGUCAAGGUCU AUGUCCAG	917
314	CAUGCUCC G CCACCUCU	333	AGAGGUGG GCCGAAAGGCGAGUCAAGGUCU GGAGCAUG	918
332	CCAGGGCU G CCAGGUGG	334	CCACCUGG GCCGAAAGGCGAGUCAAGGUCU AGCCCUGG	919
342	CAGGUGGU G CAGGGAAA	335	UUUCCCUG GCCGAAAGGCGAGUCAAGGUCU ACCACCUG	920
369	ACCUACCU G CCCACCAA	336	UUGGUGGG GCCGAAAGGCGAGUCAAGGUCU AGGUAGGU	921
379	CCACCAAU G CCAGCCUG	337	CAGGCUGG GCCGAAAGGCGAGUCAAGGUCU AUUGGUGG	922
396	UCCUUCCU G CAGGAUAU	338	AUAUCCUG GCCGAAAGGCGAGUCAAGGUCU AGGAAGGA	923
414	CAGGAGGU G CAGGGCUA	339	UAGCCCUG GCCGAAAGGCGAGUCAAGGUCU ACCUCCUG	924
426	GGCUACGU G CUCAUCGC	340	GCGAUGAG GCCGAAAGGCGAGUCAAGGUCU ACGUAGCC	925
433	UGCUCAUC G CUCACAAC	341	GUUGUGAG GCCGAAAGGCGAGUCAAGGUCU GAUGAGCA	926
462	GUCCCACU G CAGAGGCU	342	AGCCUCUG GCCGAAAGGCGAGUCAAGGUCU AGUGGGAC	927
471	CAGAGGCU G CGGAUUGU	343	ACAAUCCG GCCGAAAGGCGAGUCAAGGUCU AGCCUCUG	928
480	CGGAUUGU G CGAGGCAC	344	GUGCCUCG GCCGAAAGGCGAGUCAAGGUCU ACAAUCCG	929
511	ACAACUAU G CCCUGGCC	345	GGCCAGGG GCCGAAAGGCGAGUCAAGGUCU AUAGUUGU	930
522	CUGGCCGU G CUAGACAA	346	UUGUCUAG GCCGAAAGGCGAGUCAAGGUCU ACGGCCAG	931
540	GGAGACCC G CUGAACAA	347	UUGUUCAG GCCGAAAGGCGAGUCAAGGUCU GGGUCUCC	932
585	GGAGGCCU G CGGGAGCU	348	AGCUCCCG GCCGAAAGGCGAGUCAAGGUCU AGGCCUCC	933
594	CGGGAGCU G CAGCUUCG	349	CGAAGCUG GCCGAAAGGCGAGUCAAGGUCU AGCUCCCG	934
659	CCAGCUCU G CUACCAGG	350	CCUGGUAG GCCGAAAGGCGAGUCAAGGUCU AGAGCUGG	935
737	CACCAACC G CUCUCGGG	351	CCCGAGAG GCCGAAAGGCGAGUCAAGGUCU GGUUGGUG	936
749	UCGGGCCU G CCACCCCU	352	AGGGGUGG GCCGAAAGGCGAGUCAAGGUCU AGGCCCGA	937

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782	GGGCUCCC G CUGCUGGG	353	CCCAGCAG GCCGAAAGGCGAGUCAAGGUCU GGGAGCCC	938
785	CUCCCGCU G CUGGGGAG	354	CUCCCCAG GCCGAAAGGCGAGUCAAGGUCU AGCGGGAG	939
822	AGCCUGAC G CGCACUGU	355	ACAGUGCG GCCGAAAGGCGAGUCAAGGUCU GUCAGGCU	940
824	CCUGACGC G CACUGUCU	356	AGACAGUG GCCGAAAGGCGAGUCAAGGUCU GCGUCAGG	941
835	CUGUCUGU G CCGGUGGC	357	GCCACCGG GCCGAAAGGCGAGUCAAGGUCU ACAGACAG	942
847	GUGGCUGU G CCCGCUGC	358	GCAGCGGG GCCGAAAGGCGAGUCAAGGUCU ACAGCCAC	943
851	CUGUGCCC G CUGCAAGG	359	CCUUGCAG GCCGAAAGGCGAGUCAAGGUCU GGGCACAG	944
854	UGCCCGCU G CAAGGGGC	360	GCCCCUUG GCCGAAAGGCGAGUCAAGGUCU AGCGGGCA	945
867	GGGCCACU G CCCACUGA	361	UCAGUGGG GCCGAAAGGCGAGUCAAGGUCU AGUGGCCC	946
878	CACUGACU G CUGCCAUG	362	CAUGGCAG GCCGAAAGGCGAGUCAAGGUCU AGUCAGUG	947
881	UGACUGCU G CCAUGAGC	363	GCUCAUGG GCCGAAAGGCGAGUCAAGGUCU AGCAGUCA	948
895	AGCAGUGU G CUGCCGGC	364	GCCGGCAG GCCGAAAGGCGAGUCAAGGUCU ACACUGCU	949
898	AGUGUGCU G CCGGCUGC	365	GCAGCCGG GCCGAAAGGCGAGUCAAGGUCU AGCACACU	950
905	UGCCGGCU G CACGGGCC	366	GGCCCGUG GCCGAAAGGCGAGUCAAGGUCU AGCCGGCA	951
929	CUCUGACU G CCUGGCCU	367	AGGCCAGG GCCGAAAGGCGAGUCAAGGUCU AGUCAGAG	952
938	CCUGGCCU G CCUCCACU	368	AGUGGAGG GCCGAAAGGCGAGUCAAGGUCU AGGCCAGG	953
972	UGUGAGCU G CACUGCCC	369	GGGCAGUG GCCGAAAGGCGAGUCAAGGUCU AGCUCACA	954
977	GCUGCACU G CCCAGCCC	370	GGGCUGGG GCCGAAAGGCGAGUCAAGGUCU AGUGCAGC	955
1020	GAGUCCAU G CCCAAUCC	371	GGAUUGGG GCCGAAAGGCGAGUCAAGGUCU AUGGACUC	956
1051	CAUUCGGC G CCAGCUGU	372	ACAGCUGG GCCGAAAGGCGAGUCAAGGUCU GCCGAAUG	957
1066	GUGUGACU G CCUGUCCC	373	GGGACAGG GCCGAAAGGCGAGUCAAGGUCU AGUCACAC	958
1106	GGGAUCCU G CACCCUCG	374	CGAGGGUG GCCGAAAGGCGAGUCAAGGUCU AGGAUCCC	959
1118	CCUCGUCU G CCCCCUGC	375	GCAGGGGG GCCGAAAGGCGAGUCAAGGUCU AGACGAGG	960
1125	UGCCCCCU G CACAACCA	376	UGGUUGUG GCCGAAAGGCGAGUCAAGGUCU AGGGGGCA	961
1175	UGAGAAGU G CAGCAAGC	377	GCUUGCUG GCCGAAAGGCGAGUCAAGGUCU ACUUCUCA	962
1189	AGCCCUGU G CCCGAGUG	378	CACUCGGG GCCGAAAGGCGAGUCAAGGUCU ACAGGGCU	963
1199	CCGAGUGU G CUAUGGUC	379	GACCAUAG GCCGAAAGGCGAGUCAAGGUCU ACACUCGG	964
1224	GAGCACUU G CGAGAGGU	380	ACCUCUCG GCCGAAAGGCGAGUCAAGGUCU AAGUGCUC	965
1249	UUACCAGU G CCAAUAUC	381	GAUAUUGG GCCGAAAGGCGAGUCAAGGUCU ACUGGUAA	966
1267	AGGAGUUU G CUGGCUGC	382	GCAGCCAG GCCGAAAGGCGAGUCAAGGUCU AAACUCCU	967
1274	UGCUGGCU G CAAGAAGA	383	UCUUCUUG GCCGAAAGGCGAGUCAAGGUCU AGCCAGCA	968
1305	GCAUUUCU G CCGGAGAG	384	CUCUCCGG GCCGAAAGGCGAGUCAAGGUCU AGAAAUGC	969
1342	CCAACACU G CCCCGCUC	385	GAGCGGGG GCCGAAAGGCGAGUCAAGGUCU AGUGUUGG	970
1347	ACUGCCCC G CUCCAGCC	386	GGCUGGAG GCCGAAAGGCGAGUCAAGGUCU GGGGCAGU	971
1431	GACAGCCU G CCUGACCU	387	AGGUCAGG GCCGAAAGGCGAGUCAAGGUCU AGGCUGUC	972
1458	CAGAACCU G CAAGUAAU	388	AUUACUUG GCCGAAAGGCGAGUCAAGGUCU AGGUUCUG	973
1482	CGAAUUCU G CACAAUGG	389	CCAUUGUG GCCGAAAGGCGAGUCAAGGUCU AGAAUUCG	974
1492	ACAAUGGC G CCUACUCG	390	CGAGUAGG GCCGAAAGGCGAGUCAAGGUCU GCCAUUGU	975
1500	GCCUACUC G CUGACCCU	391	AGGGUCAG GCCGAAAGGCGAGUCAAGGUCU GAGUAGGC	976
1509	CUGACCCU G CAAGGGCU	392	AGCCCUUG GCCGAAAGGCGAGUCAAGGUCU AGGGUCAG	977
1539	CUGGGGCU G CGCUCACU	393	AGUGAGCG GCCGAAAGGCGAGUCAAGGUCU AGCCCCAG	978
1541	GGGCUGC G CUCACUGA	394	UCAGUGAG GCCGAAAGGCGAGUCAAGGUCU GCAGCCCC	979
1598	CCACCUCU G CUUCGUGC	395	GCACGAAG GCCGAAAGGCGAGUCAAGGUCU AGAGGUGG	980
1605	UGCUUCGU G CACACGGU	396	ACCGUGUG GCCGAAAGGCGAGUCAAGGUCU ACGAAGCA	981
1614	CACACGGU G CCCUGGGA	397	UCCCAGGG GCCGAAAGGCGAGUCAAGGUCU ACCGUGUG	982
1641	CGGAACCC G CACCAAGC	398	GCUUGGUG GCCGAAAGGCGAGUCAAGGUCU GGGUUCCG	983
1653	CAAGCUCU G CUCCACAC	399	GUGUGGAG GCCGAAAGGCGAGUCAAGGUCU AGAGCUUG	984

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1663	UCCACACU G CCAACCGG	400	CCGGUUGG GCCGAAAGGCGAGUCAAGGUCU AGUGUGGA	985
1706	CCUGGCCU G CCACCAGC	401	GCUGGUGG GCCGAAAGGCGAGUCAAGGUCU AGGCCAGG	986
1718	CCAGCUGU G CGCCCGAG	402	CUCGGGCG GCCGAAAGGCGAGUCAAGGUCU ACAGCUGG	987
1720	AGCUGUGC G CCCGAGGG	403	CCCUCGGG GCCGAAAGGCGAGUCAAGGUCU GCACAGCU	988
1733	AGGGCACU G CUGGGGUC	404	GACCCCAG GCCGAAAGGCGAGUCAAGGUCU AGUGCCCU	989
1766	UGUCAACU G CAGCCAGU	405	ACUGGCUG GCCGAAAGGCGAGUCAAGGUCU AGUUGACA	990
1793	CCAGGAGU G CGUGGAGG	406	CCUCCACG GCCGAAAGGCGAGUCAAGGUCU ACUCCUGG	991
1805	GGAGGAAU G CCGAGUAC	407	GUACUCGG GCCGAAAGGCGAGUCAAGGUCU AUUCCUCC	992
1815	CGAGUACU G CAGGGGCU	408	AGCCCCUG GCCGAAAGGCGAGUCAAGGUCU AGUACUCG	993
1843	AUGUGAAU G CCAGGCAC	409	GUGCCUGG GCCGAAAGGCGAGUCAAGGUCU AUUCACAU	994
1857	CACUGUUU G CCGUGCCA	410	UGGCACGG GCCGAAAGGCGAGUCAAGGUCU AAACAGUG	995
1862	UUUGCCGU G CCACCCUG	411	CAGGGUGG GCCGAAAGGCGAGUCAAGGUCU ACGGCAAA	996
1936	UGGCCUGU G CCCACUAU	412	AUAGUGGG GCCGAAAGGCGAGUCAAGGUCU ACAGGCCA	997
1961	UCCCUUCU G CGUGGCCC	413	GGGCCACG GCCGAAAGGCGAGUCAAGGUCU AGAAGGGA	998
1970	CGUGGCCC G CUGCCCCA	414	UGGGGCAG GCCGAAAGGCGAGUCAAGGUCU GGGCCACG	999
1973	GGCCCGCU G CCCCAGCG	415	CGCUGGGG GCCGAAAGGCGAGUCAAGGUCU AGCGGGCC	1000
2007	UCCUACAU G CCCAUCUG	416	CAGAUGGG GCCGAAAGGCGAGUCAAGGUCU AUGUAGGA	1001
2038	AGGAGGGC G CAUGCCAG	417	CUGGCAUG GCCGAAAGGCGAGUCAAGGUCU GCCCUCCU	1002
2042	GGGCGCAU G CCAGCCUU	418	AAGGCUGG GCCGAAAGGCGAGUCAAGGUCU AUGCGCCC	1003
2051	CCAGCCUU G CCCCAUCA	419	UGAUGGGG GCCGAAAGGCGAGUCAAGGUCU AAGGCUGG	1004
2063	CAUCAACU G CACCCACU	420	AGUGGGUG GCCGAAAGGCGAGUCAAGGUCU AGUUGAUG	1005
2099	CAAGGGCU G CCCCGCCG	421	CGGCGGGG GCCGAAAGGCGAGUCAAGGUCU AGCCCUUG	1006
2104	GCUGCCCC G CCGAGCAG	422	CUGCUCGG GCCGAAAGGCGAGUCAAGGUCU GGGGCAGC	1007
2143	UCAUCUCU G CGGUGGUU	423	AACCACCG GCCGAAAGGCGAGUCAAGGUCU AGAGAUGA	1008
2160	GGCAUUCU G CUGGUCGU	424	ACGACCAG GCCGAAAGGCGAGUCAAGGUCU AGAAUGCC	1009
2235	UACACGAU G CGGAGACU	425	AGUCUCCG GCCGAAAGGCGAGUCAAGGUCU AUCGUGUA	1010
2244	CGGAGACU G CUGCAGGA	426	UCCUGCAG GCCGAAAGGCGAGUCAAGGUCU AGUCUCCG	1011
2247	AGACUGCU G CAGGAAAC	427	GUUUCCUG GCCGAAAGGCGAGUCAAGGUCU AGCAGUCU	1012
2271	GUGGAGCC G CUGACACC	428	GGUGUCAG GCCGAAAGGCGAGUCAAGGUCU GGCUCCAC	1013
2292	GGAGCGAU G CCCAACCA	429	UGGUUGGG GCCGAAAGGCGAGUCAAGGUCU AUCGCUCC	1014
2304	AACCAGGC G CAGAUGCG	430	CGCAUCUG GCCGAAAGGCGAGUCAAGGUCU GCCUGGUU	1015
2310	GCGCAGAU G CGGAUCCU	431	AGGAUCCG GCCGAAAGGCGAGUCAAGGUCU AUCUGCGC	1016
2349	GUGAAGGU G CUUGGAUC	432	GAUCCAAG GCCGAAAGGCGAGUCAAGGUCU ACCUUCAC	1017
2362	GAUCUGGC G CUUUUGGC	433	GCCAAAAG GCCGAAAGGCGAGUCAAGGUCU GCCAGAUC	1018
2525	UGUCUCCC G CCUUCUGG	434	CCAGAAGG GCCGAAAGGCGAGUCAAGGUCU GGGAGACA	1019
2540	GGGCAUCU G CCUGACAU	435	AUGUCAGG GCCGAAAGGCGAGUCAAGGUCU AGAUGCCC	1020
2556	UCCACGGU G CAGCUGGU	436	ACCAGCUG GCCGAAAGGCGAGUCAAGGUCU ACCGUGGA	1021
2577	CAGCUUAU G CCCUAUGG	437	CCAUAGGG GCCGAAAGGCGAGUCAAGGUCU AUAAGCUG	1022
2588	CUAUGGCU G CCUCUUAG	438	CUAAGAGG GCCGAAAGGCGAGUCAAGGUCU AGCCAUAG	1023
2615	GGAAAACC G CGGACGCC	439	GGCGUCCG GCCGAAAGGCGAGUCAAGGUCU GGUUUUCC	1024
2621	CCGCGGAC G CCUGGGCU	440	AGCCCAGG GCCGAAAGGCGAGUCAAGGUCU GUCCGCGG	1025
2640	CAGGACCU G CUGAACUG	441	CAGUUCAG GCCGAAAGGCGAGUCAAGGUCU AGGUCCUG	1026
2655	UGGUGUAU G CAGAUUGC	442	GCAAUCUG GCCGAAAGGCGAGUCAAGGUCU AUACACCA	1027
2662	UGCAGAUU G CCAAGGGG	443	CCCCUUGG GCCGAAAGGCGAGUCAAGGUCU AAUCUGCA	1028
2691	GAGGAUGU G CGGCUCGU	444	ACGAGCCG GCCGAAAGGCGAGUCAAGGUCU ACAUCCUC	1029
2716	ACUUGGCC G CUCGGAAC	445	GUUCCGAG GCCGAAAGGCGAGUCAAGGUCU GGCCAAGU	1030
2727	CGGAACGU G CUGGUCAA	446	UUGACCAG GCCGAAAGGCGAGUCAAGGUCU ACGUUCCG	1031

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2781	GCUCGGCU G CUGGACAU	447	AUGUCCAG GCCGAAAGGCGAGUCAAGGUCU AGCCGAGC	1032
2809	AGUACCAU G CAGAUGGG	448	CCCAUCUG GCCGAAAGGCGAGUCAAGGUCU AUGGUACU	1033
2826	GGCAAGGU G CCCAUCAA	449	UUGAUGGG GCCGAAAGGCGAGUCAAGGUCU ACCUUGCC	1034
2844	UGGAUGGC G CUGGAGUC	450	GACUCCAG GCCGAAAGGCGAGUCAAGGUCU GCCAUCCA	1035
2861	CAUUCUCC G CCGGCGGU	451	ACCGCCGG GCCGAAAGGCGAGUCAAGGUCU GGAGAAUG	1036
2976	CCUGACCU G CUGGAAAA	452	UUUUCCAG GCCGAAAGGCGAGUCAAGGUCU AGGUCAGG	1037
2997	GAGCGGCU G CCCCAGCC	453	GGCUGGGG GCCGAAAGGCGAGUCAAGGUCU AGCCGCUC	1038
3014	CCCCAUCU G CACCAUUG	454	CAAUGGUG GCCGAAAGGCGAGUCAAGGUCU AGAUGGGG	1039
3107	AUUCUCCC G CAUGGCCA	455	UGGCCAUG GCCGAAAGGCGAGUCAAGGUCU GGGAGAAU	1040
3128	CCCCCAGC G CUUUGUGG	456	CCACAAAG GCCGAAAGGCGAGUCAAGGUCU GCUGGGGG	1041
3191	CUUCUACC G CUCACUGC	457	GCAGUGAG GCCGAAAGGCGAGUCAAGGUCU GGUAGAAG	1042
3198	CGCUCACU G CUGGAGGA	458	UCCUCCAG GCCGAAAGGCGAGUCAAGGUCU AGUGAGCG	1043
3232	UGGUGGAU G CUGAGGAG	459	CUCCUCAG GCCGAAAGGCGAGUCAAGGUCU AUCCACCA	1044
3280	CAGACCCU G CCCCGGGC	460	GCCCGGGG GCCGAAAGGCGAGUCAAGGUCU AGGGUCUG	1045
3289	CCCCGGGC G CUGGGGGC	461	GCCCCCAG GCCGAAAGGCGAGUCAAGGUCU GCCCGGGG	1046
3317	CAGGCACC G CAGCUCAU	462	AUGAGCUG GCCGAAAGGCGAGUCAAGGUCU GGUGCCUG	1047
3468	AAGGGGCU G CAAAGCCU	463	AGGCUUUG GCCGAAAGGCGAGUCAAGGUCU AGCCCCUU	1048
3534	GUACCCCU G CCCUCUGA	464	UCAGAGGG GCCGAAAGGCGAGUCAAGGUCU AGGGGUAC	1049
3559	GCUACGUU G CCCCCCUG	465	CAGGGGGG GCCGAAAGGCGAGUCAAGGUCU AACGUAGC	1050
3572	CCUGACCU G CAGCCCCC	466	GGGGGCUG GCCGAAAGGCGAGUCAAGGUCU AGGUCAGG	1051
3627	CCCCCUUC G CCCCGAGA	467	UCUCGGGG GCCGAAAGGCGAGUCAAGGUCU GAAGGGGG	1052
3645	GGCCCUCU G CCUGCUGC	468	GCAGCAGG GCCGAAAGGCGAGUCAAGGUCU AGAGGGCC	1053
3649	CUCUGCCU G CUGCCCGA	469	UCGGGCAG GCCGAAAGGCGAGUCAAGGUCU AGGCAGAG	1054
3652	UGCCUGCU G CCCGACCU	470	AGGUCGGG GCCGAAAGGCGAGUCAAGGUCU AGCAGGCA	1055
3661	CCCGACCU G CUGGUGCC	471	GGCACCAG GCCGAAAGGCGAGUCAAGGUCU AGGUCGGG	1056
3667	CUGCUGGU G CCACUCUG	472	CAGAGUGG GCCGAAAGGCGAGUCAAGGUCU ACCAGCAG	1057
3730	ACGUUUUU G CCUUUGGG	473	CCCAAAGG GCCGAAAGGCGAGUCAAGGUCU AAAAACGU	1058
3742	UUGGGGGU G CCGUGGAG	474	CUCCACGG GCCGAAAGGCGAGUCAAGGUCU ACCCCCAA	1059
3784	GAGGAGCU G CCCCUCAG	475	CUGAGGGG GCCGAAAGGCGAGUCAAGGUCU AGCUCCUC	1060
3808	CUCCUCCU G CCUUCAGC	476	GCUGAAGG GCCGAAAGGCGAGUCAAGGUCU AGGAGGAG	1061
3933	CUGGACGU G CCAGUGUG	477	CACACUGG GCCGAAAGGCGAGUCAAGGUCU ACGUCCAG	1062
3960	CCAAGUCC G CAGAAGCC	478	GGCUUCUG GCCGAAAGGCGAGUCAAGGUCU GGACUUGG	1063
4007	UGACUUCU G CUGGCAUC	479	GAUGCCAG GCCGAAAGGCGAGUCAAGGUCU AGAAGUCA	1064
4056	GGGAACCU G CCAUGCCA	480	UGGCAUGG GCCGAAAGGCGAGUCAAGGUCU AGGUUCCC	1065
4061	CCUGCCAU G CCAGGAAC	481	GUUCCUGG GCCGAAAGGCGAGUCAAGGUCU AUGGCAGG	1066
4094	UCCUUCCU G CUUGAGUU	482	AACUCAAG GCCGAAAGGCGAGUCAAGGUCU AGGAAGGA	1067
4179	GAGGCCCU G CCCAAUGA	483	UCAUUGGG GCCGAAAGGCGAGUCAAGGUCU AGGGCCUC	1068
4208	CAGUGGAU G CCACAGCC	484	GGCUGUGG GCCGAAAGGCGAGUCAAGGUCU AUCCACUG	1069
4351	CUAGUACU G CCCCCCAU	485	AUGGGGGG GCCGAAAGGCGAGUCAAGGUCU AGUACUAG	1070
4406	UACAGAGU G CUUUUCUG	486	CAGAAAAG GCCGAAAGGCGAGUCAAGGUCU ACUCUGUA	1071
192	GCGGCCUU G UGCCGCUG	487	CAGCGGCA GCCGAAAGGCGAGUCAAGGUCU AAGGCCGC	1072
249	ACCCAAGU G UGCACCGG	488	CCGGUGCA GCCGAAAGGCGAGUCAAGGUCU ACUUGGGU	1073
387	GCCAGCCU G UCCUUCCU	489	AGGAAGGA GCCGAAAGGCGAGUCAAGGUCU AGGCUGGC	1074
478	UGCGGAUU G UGCGAGGC	490	GCCUCGCA GCCGAAAGGCGAGUCAAGGUCU AAUCCGCA	1075
559	CCACCCCU G UCACAGGG	491	CCCUGUGA GCCGAAAGGCGAGUCAAGGUCU AGGGGUGG	1076
678	ACGAUUUU G UGGAAGGA	492	UCCUUCCA GCCGAAAGGCGAGUCAAGGUCU AAAAUCGU	1077
758	CCACCCCU G UUCUCCGA	493	UCGGAGAA GCCGAAAGGCGAGUCAAGGUCU AGGGGUGG	1078

Table 59

768	UCUCCGAU G UGUAAGGG	494	CCCUUACA GCCGAAAGGCGAGUCAAGGUCU AUCGGAGA	1079
770	UCCGAUGU G UAAGGGCU	495	AGCCCUUA GCCGAAAGGCGAGUCAAGGUCU ACAUCGGA	1080
809	UGAGGAUU G UCAGAGCC	496	GGCUCUGA GCCGAAAGGCGAGUCAAGGUCU AAUCCUCA	1081
829	CGCGCACU G UCUGUGCC	497	GGCACAGA GCCGAAAGGCGAGUCAAGGUCU AGUGCGCG	1082
833	CACUGUCU G UGCCGGUG	498	CACCGGCA GCCGAAAGGCGAGUCAAGGUCU AGACAGUG	1083
845	CGGUGGCU G UGCCCGCU	499	AGCGGGCA GCCGAAAGGCGAGUCAAGGUCU AGCCACCG	1084
893	UGAGCAGU G UGCUGCCG	500	CGGCAGCA GCCGAAAGGCGAGUCAAGGUCU ACUGCUCA	1085
965	UGGCAUCU G UGAGCUGC	501	GCAGCUCA GCCGAAAGGCGAGUCAAGGUCU AGAUGCCA	1086
1058	CGCCAGCU G UGUGACUG	502	CAGUCACA GCCGAAAGGCGAGUCAAGGUCU AGCUGGCG	1087
1060	CCAGCUGU G UGACUGCC	503	GGCAGUCA GCCGAAAGGCGAGUCAAGGUCU ACAGCUGG	1088
1070	GACUGCCU G UCCCUACA	504	UGUAGGGA GCCGAAAGGCGAGUCAAGGUCU AGGCAGUC	1089
1166	ACAGCGGU G UGAGAAGU	505	ACUUCUCA GCCGAAAGGCGAGUCAAGGUCU ACCGCUGU	1090
1187	CAAGCCCU G UGCCCGAG	506	CUCGGGCA GCCGAAAGGCGAGUCAAGGUCU AGGGCUUG	1091
1197	GCCCGAGU G UGCUAUGG	507	CCAUAGCA GCCGAAAGGCGAGUCAAGGUCU ACUCGGGC	1092
1371	CUCCAAGU G UUUGAGAC	508	GUCUCAAA GCCGAAAGGCGAGUCAAGGUCU ACUUGGAG	1093
1685	GGACGAGU G UGUGGGCG	509	CGCCCACA GCCGAAAGGCGAGUCAAGGUCU ACUCGUCC	1094
1687	ACGAGUGU G UGGGCGAG	510	CUCGCCCA GCCGAAAGGCGAGUCAAGGUCU ACACUCGU	1095
1716	CACCAGCU G UGCGCCCG	511	CGGGCGCA GCCGAAAGGCGAGUCAAGGUCU AGCUGGUG	1096
1757	CACCCAGU G UGUCAACU	512	AGUUGACA GCCGAAAGGCGAGUCAAGGUCU ACUGGGUG	1097
1759	CCCAGUGU G UCAACUGC	513	GCAGUUGA GCCGAAAGGCGAGUCAAGGUCU ACACUGGG	1098
1837	GGGAGUAU G UGAAUGCC	514	GGCAUUCA GCCGAAAGGCGAGUCAAGGUCU AUACUCCC	1099
1853	CAGGCACU G UUUGCCGU	515	ACGGCAAA GCCGAAAGGCGAGUCAAGGUCU AGUGCCUG	1100
1874	CCCUGAGU G UCAGCCCC	516	GGGGCUGA GCCGAAAGGCGAGUCAAGGUCU ACUCAGGG	1101
1901	AGUGACCU G UUUUGGAC	517	GUCCAAAA GCCGAAAGGCGAGUCAAGGUCU AGGUCACU	1102
1925	UGACCAGU G UGUGGCCU	518	AGGCCACA GCCGAAAGGCGAGUCAAGGUCU ACUGGUCA	1103
1927	ACCAGUGU G UGGCCUGU	519	ACAGGCCA GCCGAAAGGCGAGUCAAGGUCU ACACUGGU	1104
1934	UGUGGCCU G UGCCCACU	520	AGUGGGCA GCCGAAAGGCGAGUCAAGGUCU AGGCCACA	1105
1984	CCAGCGGU G UGAAACCU	521	AGGUUUCA GCCGAAAGGCGAGUCAAGGUCU ACCGCUGG	1106
2075	CCACUCCU G UGUGGACC	522	GGUCCACA GCCGAAAGGCGAGUCAAGGUCU AGGAGUGG	1107
2077	ACUCCUGU G UGGACCUG	523	CAGGUCCA GCCGAAAGGCGAGUCAAGGUCU ACAGGAGU	1108
2410	GGGAGAAU G UGAAAAUU	524	AAUUUUCA GCCGAAAGGCGAGUCAAGGUCU AUUCUCCC	1109
2436	AUCAAAGU G UUGAGGGA	525	UCCCUCAA GCCGAAAGGCGAGUCAAGGUCU ACUUUGAU	1110
2503	UGGCUGGU G UGGGCUCC	526	GGAGCCCA GCCGAAAGGCGAGUCAAGGUCU ACCAGCCA	1111
2518	CCCCAUAU G UCUCCCGC	527	GCGGGAGA GCCGAAAGGCGAGUCAAGGUCU AUAUGGGG	1112
2602	UAGACCAU G UCCGGGAA	528	UUCCCGGA GCCGAAAGGCGAGUCAAGGUCU AUGGUCUA	1113
2651	GAACUGGU G UAUGCAGA	529	UCUGCAUA GCCGAAAGGCGAGUCAAGGUCU ACCAGUUC	1114
2689	UGGAGGAU G UGCGGCUC	530	GAGCCGCA GCCGAAAGGCGAGUCAAGGUCU AUCCUCCA	1115
2749	CCAACCAU G UCAAAAUU	531	AAUUUUGA GCCGAAAGGCGAGUCAAGGUCU AUGGUUGG	1116
2887	AGAGUGAU G UGUGGAGU	532	ACUCCACA GCCGAAAGGCGAGUCAAGGUCU AUCACUCU	1117
2889	AGUGAUGU G UGGAGUUA	533	UAACUCCA GCCGAAAGGCGAGUCAAGGUCU ACAUCACU	1118
2902	GUUAUGGU G UGACUGUG	534	CACAGUCA GCCGAAAGGCGAGUCAAGGUCU ACCAUAAC	1119
2908	GUGUGACU G UGUGGGAG	535	CUCCCACA GCCGAAAGGCGAGUCAAGGUCU AGUCACAC	1120
2910	GUGACUGU G UGGGAGCU	536	AGCUCCCA GCCGAAAGGCGAGUCAAGGUCU ACAGUCAC	1121
3025	CCAUUGAU G UCUACAUG	537	CAUGUAGA GCCGAAAGGCGAGUCAAGGUCU AUCAAUGG	1122
3047	GGUCAAAU G UUGGAUGA	538	UCAUCCAA GCCGAAAGGCGAGUCAAGGUCU AUUUGACC	1123
3068	CUCUGAAU G UCGGCCAA	539	UUGGCCGA GCCGAAAGGCGAGUCAAGGUCU AUUCAGAG	1124
3093	GAGUUGGU G UCUGAAUU	540	AAUUCAGA GCCGAAAGGCGAGUCAAGGUCU ACCAACUC	1125

Table 59

3133	AGCGCUUU G UGGUCAUC	541	GAUGACCA GCCGAAAGGCGAGUCAAGGUCU AAAGCGCU	1126
3269	CUUCUUCU G UCCAGACC	542	GGUCUGGA GCCGAAAGGCGAGUCAAGGUCU AGAAGAAG	1127
3427	GCUCCGAU G UAUUUGAU	543	AUCAAAUA GCCGAAAGGCGAGUCAAGGUCU AUCGGAGC	1128
3592	CUGAAUAU G UGAACCAG	544	CUGGUUCA GCCGAAAGGCGAGUCAAGGUCU AUAUUCAG	1129
3607	AGCCAGAU G UUCGGCCC	545	GGGCCGAA GCCGAAAGGCGAGUCAAGGUCU AUCUGGCU	1130
3939	GUGCCAGU G UGAACCAG	546	CUGGUUCA GCCGAAAGGCGAGUCAAGGUCU ACUGGCAC	1131
3974	GCCCUGAU G UGUCCUCA	547	UGAGGACA GCCGAAAGGCGAGUCAAGGUCU AUCAGGGC	1132
3976	CCUGAUGU G UCCUCAGG	548	CCUGAGGA GCCGAAAGGCGAGUCAAGGUCU ACAUCAGG	1133
4072	AGGAACCU G UCCUAAGG	549	CCUUAGGA GCCGAAAGGCGAGUCAAGGUCU AGGUUCCU	1134
4162	GAGUCUUU G UGGAUUCU	550	AGAAUCCA GCCGAAAGGCGAGUCAAGGUCU AAAGACUC	1135
4300	AAGGGAGU G UCUAAGAA	551	UUCUUAGA GCCGAAAGGCGAGUCAAGGUCU ACUCCCUU	1136
4332	CAGAGACU G UCCCUGAA	552	UUCAGGGA GCCGAAAGGCGAGUCAAGGUCU AGUCUCUG	1137
4380	GCAAUGGU G UCAGUAUC	553	GAUACUGA GCCGAAAGGCGAGUCAAGGUCU ACCAUUGC	1138
4397	CAGGCUUU G UACAGAGU	554	ACUCUGUA GCCGAAAGGCGAGUCAAGGUCU AAAGCCUG	1139
4414	GCUUUUCU G UUUAGUUU	555	AAACUAAA GCCGAAAGGCGAGUCAAGGUCU AGAAAAGC	1140
4434	CUUUUUUU G UUUUGUUU	556	AAACAAAA GCCGAAAGGCGAGUCAAGGUCU AAAAAAAG	1141
4439	UUUGUUUU G UUUUUUUA	557	UAAAAAAA GCCGAAAGGCGAGUCAAGGUCU AAAACAAA	1142
9	AAGGGGAG G UAACCCUG	558	CAGGGUUA GCCGAAAGGCGAGUCAAGGUCU CUCCCCUU	1143
18	UAACCCUG G CCCCUUUG	559	CAAAGGGG GCCGAAAGGCGAGUCAAGGUCU CAGGGUUA	1144
27	CCCCUUUG G UCGGGGCC	560	GGCCCCGA GCCGAAAGGCGAGUCAAGGUCU CAAAGGGG	1145
33	UGGUCGGG G CCCCGGGC	561	GCCCGGGG GCCGAAAGGCGAGUCAAGGUCU CCCGACCA	1146
40	GGCCCCGG G CAGCCGCG	562	CGCGGCUG GCCGAAAGGCGAGUCAAGGUCU CCGGGGCC	1147
43	CCCGGGCA G CCGCGCGC	563	GCGCGCGG GCCGAAAGGCGAGUCAAGGUCU UGCCCGGG	1148
65	CCCACGGG G CCCUUUAC	564	GUAAAGGG GCCGAAAGGCGAGUCAAGGUCU CCCGUGGG	1149
89	CGCGCCCG G CCCCCACC	565	GGUGGGGG GCCGAAAGGCGAGUCAAGGUCU CGGGCGCG	1150
105	CCCUCGCA G CACCCCGC	566	GCGGGGUG GCCGAAAGGCGAGUCAAGGUCU UGCGAGGG	1151
130	CCCUCCCA G CCGGGUCC	567	GGACCCGG GCCGAAAGGCGAGUCAAGGUCU UGGGAGGG	1152
135	CCAGCCGG G UCCAGCCG	568	CGGCUGGA GCCGAAAGGCGAGUCAAGGUCU CCGGCUGG	1153
140	CGGGUCCA G CCGGAGCC	569	GGCUCCGG GCCGAAAGGCGAGUCAAGGUCU UGGACCCG	1154
146	CAGCCGGA G CCAUGGGG	570	CCCCAUGG GCCGAAAGGCGAGUCAAGGUCU UCCGGCUG	1155
154	GCCAUGGG G CCGGAGCC	571	GGCUCCGG GCCGAAAGGCGAGUCAAGGUCU CCCAUGGC	1156
160	GGGCCGGA G CCGCAGUG	572	CACUGCGG GCCGAAAGGCGAGUCAAGGUCU UCCGGCCC	1157
166	GAGCCGCA G UGAGCACC	573	GGUGCUCA GCCGAAAGGCGAGUCAAGGUCU UGCGGCUC	1158
170	CGCAGUGA G CACCAUGG	574	CCAUGGUG GCCGAAAGGCGAGUCAAGGUCU UCACUGCG	1159
180	ACCAUGGA G CUGGCGGC	575	GCCGCCAG GCCGAAAGGCGAGUCAAGGUCU UCCAUGGU	1160
184	UGGAGCUG G CGGCCUUG	576	CAAGGCCG GCCGAAAGGCGAGUCAAGGUCU CAGCUCCA	1161
187	AGCUGGCG G CCUUGUGC	577	GCACAAGG GCCGAAAGGCGAGUCAAGGUCU CGCCAGCU	1162
204	CGCUGGGG G CUCCUCCU	578	AGGAGGAG GCCGAAAGGCGAGUCAAGGUCU CCCCAGCG	1163
232	CCCCCGGA G CCGCGAGC	579	GCUCGCGG GCCGAAAGGCGAGUCAAGGUCU UCCGGGGG	1164
239	AGCCGCGA G CACCCAAG	580	CUUGGGUG GCCGAAAGGCGAGUCAAGGUCU UCGCGGCU	1165
247	GCACCCAA G UGUGCACC	581	GGUGCACA GCCGAAAGGCGAGUCAAGGUCU UUGGGUGC	1166
257	GUGCACCG G CACAGACA	582	UGUCUGUG GCCGAAAGGCGAGUCAAGGUCU CGGUGCAC	1167
270	GACAUGAA G CUGCGGCU	583	AGCCGCAG GCCGAAAGGCGAGUCAAGGUCU UUCAUGUC	1168
276	AAGCUGCG G CUCCCUGC	584	GCAGGGAG GCCGAAAGGCGAGUCAAGGUCU CGCAGCUU	1169
287	CCCUGCCA G UCCCGAGA	585	UCUCGGGA GCCGAAAGGCGAGUCAAGGUCU UGGCAGGG	1170
329	CUACCAGG G CUGCCAGG	586	CCUGGCAG GCCGAAAGGCGAGUCAAGGUCU CCUGGUAG	1171
337	GCUGCCAG G UGGUGCAG	587	CUGCACCA GCCGAAAGGCGAGUCAAGGUCU CUGGCAGC	1172

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340	GCCAGGUG G UGCAGGGA	588	UCCCUGCA GCCGAAAGGCGAGUCAAGGUCU CACCUGGC	1173
383	CAAUGCCA G CCUGUCCU	589	AGGACAGG GCCGAAAGGCGAGUCAAGGUCU UGGCAUUG	1174
412	UCCAGGAG G UGCAGGGC	590	GCCCUGCA GCCGAAAGGCGAGUCAAGGUCU CUCCUGGA	1175
419	GGUGCAGG G CUACGUGC	591	GCACGUAG GCCGAAAGGCGAGUCAAGGUCU CCUGCACC	1176
424	AGGGCUAC G UGCUCAUC	592	GAUGAGCA GCCGAAAGGCGAGUCAAGGUCU GUAGCCCU	1177
445	ACAACCAA G UGAGGCAG	593	CUGCCUCA GCCGAAAGGCGAGUCAAGGUCU UUGGUUGU	1178
450	CAAGUGAG G CAGGUCCC	594	GGGACCUG GCCGAAAGGCGAGUCAAGGUCU CUCACUUG	1179
454	UGAGGCAG G UCCCACUG	595	CAGUGGGA GCCGAAAGGCGAGUCAAGGUCU CUGCCUCA	1180
468	CUGCAGAG G CUGCGGAU	596	AUCCGCAG GCCGAAAGGCGAGUCAAGGUCU CUCUGCAG	1181
485	UGUGCGAG G CACCCAGC	597	GCUGGGUG GCCGAAAGGCGAGUCAAGGUCU CUCGCACA	1182
492	GGCACCCA G CUCUUUGA	598	UCAAAGAG GCCGAAAGGCGAGUCAAGGUCU UGGGUGCC	1183
517	AUGCCCUG G CCGUGCUA	599	UAGCACGG GCCGAAAGGCGAGUCAAGGUCU CAGGGCAU	1184
520	CCCUGGCC G UGCUAGAC	600	GUCUAGCA GCCGAAAGGCGAGUCAAGGUCU GGCCAGGG	1185
568	UCACAGGG G CCUCCCCA	601	UGGGGAGG GCCGAAAGGCGAGUCAAGGUCU CCCUGUGA	1186
581	CCCAGGAG G CCUGCGGG	602	CCCGCAGG GCCGAAAGGCGAGUCAAGGUCU CUCCUGGG	1187
591	CUGCGGGA G CUGCAGCU	603	AGCUGCAG GCCGAAAGGCGAGUCAAGGUCU UCCCGCAG	1188
597	GAGCUGCA G CUUCGAAG	604	CUUCGAAG GCCGAAAGGCGAGUCAAGGUCU UGCAGCUC	1189
605	GCUUCGAA G CCUCACAG	605	CUGUGAGG GCCGAAAGGCGAGUCAAGGUCU UUCGAAGC	1190
631	AAGGAGGG G UCUUGAUC	606	GAUCAAGA GCCGAAAGGCGAGUCAAGGUCU CCCUCCUU	1191
642	UUGAUCCA G CGGAACCC	607	GGGUUCCG GCCGAAAGGCGAGUCAAGGUCU UGGAUCAA	1192
654	AACCCCCA G CUCUGCUA	608	UAGCAGAG GCCGAAAGGCGAGUCAAGGUCU UGGGGGUU	1193
708	AACAACCA G CUGGCUCU	609	AGAGCCAG GCCGAAAGGCGAGUCAAGGUCU UGGUUGUU	1194
712	ACCAGCUG G CUCUCACA	610	UGUGAGAG GCCGAAAGGCGAGUCAAGGUCU CAGCUGGU	1195
745	GCUCUCGG G CCUGCCAC	611	GUGGCAGG GCCGAAAGGCGAGUCAAGGUCU CCGAGAGC	1196
776	GUGUAAGG G CUCCCGCU	612	AGCGGGAG GCCGAAAGGCGAGUCAAGGUCU CCUUACAC	1197
797	GGGAGAGA G UUCUGAGG	613	CCUCAGAA GCCGAAAGGCGAGUCAAGGUCU UCUCUCCC	1198
815	UUGUCAGA G CCUGACGC	614	GCGUCAGG GCCGAAAGGCGAGUCAAGGUCU UCUGACAA	1199
839	CUGUGCCG G UGGCUGUG	615	CACAGCCA GCCGAAAGGCGAGUCAAGGUCU CGGCACAG	1200
842	UGCCGGUG G CUGUGCCC	616	GGGCACAG GCCGAAAGGCGAGUCAAGGUCU CACCGGCA	1201
861	UGCAAGGG G CCACUGCC	617	GGCAGUGG GCCGAAAGGCGAGUCAAGGUCU CCCUUGCA	1202
888	UGCCAUGA G CAGUGUGC	618	GCACACUG GCCGAAAGGCGAGUCAAGGUCU UCAUGGCA	1203
891	CAUGAGCA G UGUGCUGC	619	GCAGCACA GCCGAAAGGCGAGUCAAGGUCU UGCUCAUG	1204
902	UGCUGCCG G CUGCACGG	620	CCGUGCAG GCCGAAAGGCGAGUCAAGGUCU CGGCAGCA	1205
911	CUGCACGG G CCCCAAGC	621	GCUUGGGG GCCGAAAGGCGAGUCAAGGUCU CCGUGCAG	1206
918	GGCCCCAA G CACUCUGA	622	UCAGAGUG GCCGAAAGGCGAGUCAAGGUCU UUGGGGCC	1207
934	ACUGCCUG G CCUGCCUC	623	GAGGCAGG GCCGAAAGGCGAGUCAAGGUCU CAGGCAGU	1208
956	CAACCACA G UGGCAUCU	624	AGAUGCCA GCCGAAAGGCGAGUCAAGGUCU UGUGGUUG	1209
959	CCACAGUG G CAUCUGUG	625	CACAGAUG GCCGAAAGGCGAGUCAAGGUCU CACUGUGG	1210
969	AUCUGUGA G CUGCACUG	626	CAGUGCAG GCCGAAAGGCGAGUCAAGGUCU UCACAGAU	1211
982	ACUGCCCA G CCCUGGUC	627	GACCAGGG GCCGAAAGGCGAGUCAAGGUCU UGGGCAGU	1212
988	CAGCCCUG G UCACCUAC	628	GUAGGUGA GCCGAAAGGCGAGUCAAGGUCU CAGGGCUG	1213
1008	ACAGACAC G UUUGAGUC	629	GACUCAAA GCCGAAAGGCGAGUCAAGGUCU GUGUCUGU	1214
1014	ACGUUUGA G UCCAUGCC	630	GGCAUGGA GCCGAAAGGCGAGUCAAGGUCU UCAAACGU	1215
1034	UCCCGAGG G CCGGUAUA	631	UAUACCGG GCCGAAAGGCGAGUCAAGGUCU CCUCGGGA	1216
1038	GAGGGCCG G UAUACAUU	632	AAUGUAUA GCCGAAAGGCGAGUCAAGGUCU CGGCCCUC	1217
1049	UACAUUCG G CGCCAGCU	633	AGCUGGCG GCCGAAAGGCGAGUCAAGGUCU CGAAUGUA	1218
1055	CGGCGCCA G CUGUGUGA	634	UCACACAG GCCGAAAGGCGAGUCAAGGUCU UGGCGCCG	1219

Table 59

1096	CUACGGAC G UGGGAUCC	635	GGAUCCCA GCCGAAAGGCGAGUCAAGGUCU GUCCGUAG	1220
1114	GCACCCUC G UCUGCCCC	636	GGGGCAGA GCCGAAAGGCGAGUCAAGGUCU GAGGGUGC	1221
1138	ACCAAGAG G UGACAGCA	637	UGCUGUCA GCCGAAAGGCGAGUCAAGGUCU CUCUUGGU	1222
1144	AGGUGACA G CAGAGGAU	638	AUCCUCUG GCCGAAAGGCGAGUCAAGGUCU UGUCACCU	1223
1161	GGAACACA G CGGUGUGA	639	UCACACCG GCCGAAAGGCGAGUCAAGGUCU UGUGUUCC	1224
1164	ACACAGCG G UGUGAGAA	640	UUCUCACA GCCGAAAGGCGAGUCAAGGUCU CGCUGUGU	1225
1173	UGUGAGAA G UGCAGCAA	641	UUGCUGCA GCCGAAAGGCGAGUCAAGGUCU UUCUCACA	1226
1178	GAAGUGCA G CAAGCCCU	642	AGGGCUUG GCCGAAAGGCGAGUCAAGGUCU UGCACUUC	1227
1182	UGCAGCAA G CCCUGUGC	643	GCACAGGG GCCGAAAGGCGAGUCAAGGUCU UUGCUGCA	1228
1195	GUGCCCGA G UGUGCUAU	644	AUAGCACA GCCGAAAGGCGAGUCAAGGUCU UCGGGCAC	1229
1205	GUGCUAUG G UCUGGGCA	645	UGCCCAGA GCCGAAAGGCGAGUCAAGGUCU CAUAGCAC	1230
1211	UGGUCUGG G CAUGGAGC	646	GCUCCAUG GCCGAAAGGCGAGUCAAGGUCU CCAGACCA	1231
1218	GGCAUGGA G CACUUGCG	647	CGCAAGUG GCCGAAAGGCGAGUCAAGGUCU UCCAUGCC	1232
1231	UGCGAGAG G UGAGGGCA	648	UGCCCUCA GCCGAAAGGCGAGUCAAGGUCU CUCUCGCA	1233
1237	AGGUGAGG G CAGUUACC	649	GGUAACUG GCCGAAAGGCGAGUCAAGGUCU CCUCACCU	1234
1240	UGAGGGCA G UUACCAGU	650	ACUGGUAA GCCGAAAGGCGAGUCAAGGUCU UGCCCUCA	1235
1247	AGUUACCA G UGCCAAUA	651	UAUUGGCA GCCGAAAGGCGAGUCAAGGUCU UGGUAACU	1236
1263	AUCCAGGA G UUUGCUGG	652	CCAGCAAA GCCGAAAGGCGAGUCAAGGUCU UCCUGGAU	1237
1271	GUUUGCUG G CUGCAAGA	653	UCUUGCAG GCCGAAAGGCGAGUCAAGGUCU CAGCAAAC	1238
1292	CUUUGGGA G CCUGGCAU	654	AUGCCAGG GCCGAAAGGCGAGUCAAGGUCU UCCCAAAG	1239
1297	GGAGCCUG G CAUUUCUG	655	CAGAAAUG GCCGAAAGGCGAGUCAAGGUCU CAGGCUCC	1240
1313	GCCGGAGA G CUUUGAUG	656	CAUCAAAG GCCGAAAGGCGAGUCAAGGUCU UCUCCGGC	1241
1330	GGGACCCA G CCUCCAAC	657	GUUGGAGG GCCGAAAGGCGAGUCAAGGUCU UGGGUCCC	1242
1353	CCGCUCCA G CCAGAGCA	658	UGCUCUGG GCCGAAAGGCGAGUCAAGGUCU UGGAGCGG	1243
1359	CAGCCAGA G CAGCUCCA	659	UGGAGCUG GCCGAAAGGCGAGUCAAGGUCU UCUGGCUG	1244
1362	CCAGAGCA G CUCCAAGU	660	ACUUGGAG GCCGAAAGGCGAGUCAAGGUCU UGCUCUGG	1245
1369	AGCUCCAA G UGUUUGAG	661	CUCAAACA GCCGAAAGGCGAGUCAAGGUCU UUGGAGCU	1246
1397	GAUCACAG G UUACCUAU	662	AUAGGUAA GCCGAAAGGCGAGUCAAGGUCU CUGUGAUC	1247
1414	ACAUCUCA G CAUGGCCG	663	CGGCCAUG GCCGAAAGGCGAGUCAAGGUCU UGAGAUGU	1248
1419	UCAGCAUG G CCGGACAG	664	CUGUCCGG GCCGAAAGGCGAGUCAAGGUCU CAUGCUGA	1249
1427	GCCGGACA G CCUGCCUG	665	CAGGCAGG GCCGAAAGGCGAGUCAAGGUCU UGUCCGGC	1250
1442	UGACCUCA G CGUCUUCC	666	GGAAGACG GCCGAAAGGCGAGUCAAGGUCU UGAGGUCA	1251
1444	ACCUCAGC G UCUUCCAG	667	CUGGAAGA GCCGAAAGGCGAGUCAAGGUCU GCUGAGGU	1252
1462	ACCUGCAA G UAAUCCGG	668	CCGGAUUA GCCGAAAGGCGAGUCAAGGUCU UUGCAGGU	1253
1490	GCACAAUG G CGCCUACU	669	AGUAGGCG GCCGAAAGGCGAGUCAAGGUCU CAUUGUGC	1254
1515	CUGCAAGG G CUGGGCAU	670	AUGCCCAG GCCGAAAGGCGAGUCAAGGUCU CCUUGCAG	1255
1520	AGGGCUGG G CAUCAGCU	671	AGCUGAUG GCCGAAAGGCGAGUCAAGGUCU CCAGCCCU	1256
1526	GGGCAUCA G CUGGCUGG	672	CCAGCCAG GCCGAAAGGCGAGUCAAGGUCU UGAUGCCC	1257
1530	AUCAGCUG G CUGGGGCU	673	AGCCCCAG GCCGAAAGGCGAGUCAAGGUCU CAGCUGAU	1258
1536	UGGCUGGG G CUGCGCUC	674	GAGCGCAG GCCGAAAGGCGAGUCAAGGUCU CCCAGCCA	1259
1559	GGAACUGG G CAGUGGAC	675	GUCCACUG GCCGAAAGGCGAGUCAAGGUCU CCAGUUCC	1260
1562	ACUGGGCA G UGGACUGG	676	CCAGUCCA GCCGAAAGGCGAGUCAAGGUCU UGCCCAGU	1261
1570	GUGGACUG G CCCUCAUC	677	GAUGAGGG GCCGAAAGGCGAGUCAAGGUCU CAGUCCAC	1262
1603	UCUGCUUC G UGCACACG	678	CGUGUGCA GCCGAAAGGCGAGUCAAGGUCU GAAGCAGA	1263
1612	UGCACACG G UGCCCUGG	679	CCAGGGCA GCCGAAAGGCGAGUCAAGGUCU CGUGUGCA	1264
1626	UGGGACCA G CUCUUUCG	680	CGAAAGAG GCCGAAAGGCGAGUCAAGGUCU UGGUCCCA	1265
1648	CGCACCAA G CUCUGCUC	681	GAGCAGAG GCCGAAAGGCGAGUCAAGGUCU UUGGUGCG	1266

Table 59

1671	GCCAACCG G CCAGAGGA	682	UCCUCUGG GCCGAAAGGCGAGUCAAGGUCU CGGUUGGC	1267
1683	GAGGACGA G UGUGUGGG	683	CCCACACA GCCGAAAGGCGAGUCAAGGUCU UCGUCCUC	1268
1691	GUGUGUGG G CGAGGGCC	684	GGCCCUCG GCCGAAAGGCGAGUCAAGGUCU CCACACAC	1269
1697	GGGCGAGG G CCUGGCCU	685	AGGCCAGG GCCGAAAGGCGAGUCAAGGUCU CCUCGCCC	1270
1702	AGGGCCUG G CCUGCCAC	686	GUGGCAGG GCCGAAAGGCGAGUCAAGGUCU CAGGCCCU	1271
1713	UGCCACCA G CUGUGCGC	687	GCGCACAG GCCGAAAGGCGAGUCAAGGUCU UGGUGGCA	1272
1728	GCCCGAGG G CACUGCUG	688	CAGCAGUG GCCGAAAGGCGAGUCAAGGUCU CCUCGGGC	1273
1739	CUGCUGGG G UCCAGGGC	689	GCCCUGGA GCCGAAAGGCGAGUCAAGGUCU CCCAGCAG	1274
1746	GGUCCAGG G CCCACCCA	690	UGGGUGGG GCCGAAAGGCGAGUCAAGGUCU CCUGGACC	1275
1755	CCCACCCA G UGUGUCAA	691	UUGACACA GCCGAAAGGCGAGUCAAGGUCU UGGGUGGG	1276
1769	CAACUGCA G CCAGUUCC	692	GGAACUGG GCCGAAAGGCGAGUCAAGGUCU UGCAGUUG	1277
1773	UGCAGCCA G UUCCUUCG	693	CGAAGGAA GCCGAAAGGCGAGUCAAGGUCU UGGCUGCA	1278
1784	CCUUCGGG G CCAGGAGU	694	ACUCCUGG GCCGAAAGGCGAGUCAAGGUCU CCCGAAGG	1279
1791	GGCCAGGA G UGCGUGGA	695	UCCACGCA GCCGAAAGGCGAGUCAAGGUCU UCCUGGCC	1280
1795	AGGAGUGC G UGGAGGAA	696	UUCCUCCA GCCGAAAGGCGAGUCAAGGUCU GCACUCCU	1281
1810	AAUGCCGA G UACUGCAG	697	CUGCAGUA GCCGAAAGGCGAGUCAAGGUCU UCGGCAUU	1282
1821	CUGCAGGG G CUCCCCAG	698	CUGGGGAG GCCGAAAGGCGAGUCAAGGUCU CCCUGCAG	1283
1833	CCCAGGGA G UAUGUGAA	699	UUCACAUA GCCGAAAGGCGAGUCAAGGUCU UCCCUGGG	1284
1848	AAUGCCAG G CACUGUUU	700	AAACAGUG GCCGAAAGGCGAGUCAAGGUCU CUGGCAUU	1285
1860	UGUUUGCC G UGCCACCC	701	GGGUGGCA GCCGAAAGGCGAGUCAAGGUCU GGCAAACA	1286
1872	CACCCUGA G UGUCAGCC	702	GGCUGACA GCCGAAAGGCGAGUCAAGGUCU UCAGGGUG	1287
1878	GAGUGUCA G CCCCAGAA	703	UUCUGGGG GCCGAAAGGCGAGUCAAGGUCU UGACACUC	1288
1889	CCAGAAUG G CUCAGUGA	704	UCACUGAG GCCGAAAGGCGAGUCAAGGUCU CAUUCUGG	1289
1894	AUGGCUCA G UGACCUGU	705	ACAGGUCA GCCGAAAGGCGAGUCAAGGUCU UGAGCCAU	1290
1915	GACCGGAG G CUGACCAG	706	CUGGUCAG GCCGAAAGGCGAGUCAAGGUCU CUCCGGUC	1291
1923	GCUGACCA G UGUGUGGC	707	GCCACACA GCCGAAAGGCGAGUCAAGGUCU UGGUCAGC	1292
1930	AGUGUGUG G CCUGUGCC	708	GGCACAGG GCCGAAAGGCGAGUCAAGGUCU CACACACU	1293
1963	CCUUCUGC G UGGCCCGC	709	GCGGGCCA GCCGAAAGGCGAGUCAAGGUCU GCAGAAGG	1294
1966	UCUGCGUG G CCCGCUGC	710	GCAGCGGG GCCGAAAGGCGAGUCAAGGUCU CACGCAGA	1295
1979	CUGCCCCA G CGGUGUGA	711	UCACACCG GCCGAAAGGCGAGUCAAGGUCU UGGGGCAG	1296
1982	CCCCAGCG G UGUGAAAC	712	GUUUCACA GCCGAAAGGCGAGUCAAGGUCU CGCUGGGG	1297
2019	AUCUGGAA G UUUCCAGA	713	UCUGGAAA GCCGAAAGGCGAGUCAAGGUCU UUCCAGAU	1298
2036	UGAGGAGG G CGCAUGCC	714	GGCAUGCG GCCGAAAGGCGAGUCAAGGUCU CCUCCUCA	1299
2046	GCAUGCCA G CCUUGCCC	715	GGGCAAGG GCCGAAAGGCGAGUCAAGGUCU UGGCAUGC	1300
2096	UGACAAGG G CUGCCCCG	716	CGGGGCAG GCCGAAAGGCGAGUCAAGGUCU CCUUGUCA	1301
2109	CCCGCCGA G CAGAGAGC	717	GCUCUCUG GCCGAAAGGCGAGUCAAGGUCU UCGGCGGG	1302
2116	AGCAGAGA G CCAGCCCU	718	AGGGCUGG GCCGAAAGGCGAGUCAAGGUCU UCUCUGCU	1303
2120	GAGAGCCA G CCCUCUGA	719	UCAGAGGG GCCGAAAGGCGAGUCAAGGUCU UGGCUCUC	1304
2130	CCUCUGAC G UCCAUCAU	720	AUGAUGGA GCCGAAAGGCGAGUCAAGGUCU GUCAGAGG	1305
2146	UCUCUGCG G UGGUUGGC	721	GCCAACCA GCCGAAAGGCGAGUCAAGGUCU CGCAGAGA	1306
2149	CUGCGGUG G UUGGCAUU	722	AAUGCCAA GCCGAAAGGCGAGUCAAGGUCU CACCGCAG	1307
2153	GGUGGUUG G CAUUCUGC	723	GCAGAAUG GCCGAAAGGCGAGUCAAGGUCU CAACCACC	1308
2164	UUCUGCUG G UCGUGGUC	724	GACCACGA GCCGAAAGGCGAGUCAAGGUCU CAGCAGAA	1309
2167	UGCUGGUC G UGGUCUUG	725	CAAGACCA GCCGAAAGGCGAGUCAAGGUCU GACCAGCA	1310
2170	UGGUCGUG G UCUUGGGG	726	CCCCAAGA GCCGAAAGGCGAGUCAAGGUCU CACGACCA	1311
2179	UCUUGGGG G UGGUCUUU	727	AAAGACCA GCCGAAAGGCGAGUCAAGGUCU CCCCAAGA	1312
2182	UGGGGGUG G UCUUUGGG	728	CCCAAAGA GCCGAAAGGCGAGUCAAGGUCU CACCCCCA	1313

Table 59

2202	CUCAUCAA G CGACGGCA	729	UGCCGUCG GCCGAAAGGCGAGUCAAGGUCU UUGAUGAG	1314
2208	AAGCGACG G CAGCAGAA	730	UUCUGCUG GCCGAAAGGCGAGUCAAGGUCU CGUCGCUU	1315
2211	CGACGGCA G CAGAAGAU	731	AUCUUCUG GCCGAAAGGCGAGUCAAGGUCU UGCCGUCG	1316
2226	AUCCGGAA G UACACGAU	732	AUCGUGUA GCCGAAAGGCGAGUCAAGGUCU UUCCGGAU	1317
2259	GAAACGGA G CUGGUGGA	733	UCCACCAG GCCGAAAGGCGAGUCAAGGUCU UCCGUUUC	1318
2263	CGGAGCUG G UGGAGCCG	734	CGGCUCCA GCCGAAAGGCGAGUCAAGGUCU CAGCUCCG	1319
2268	CUGGUGGA G CCGCUGAC	735	GUCAGCGG GCCGAAAGGCGAGUCAAGGUCU UCCACCAG	1320
2282	GACACCUA G CGGAGCGA	736	UCGCUCCG GCCGAAAGGCGAGUCAAGGUCU UAGGUGUC	1321
2287	CUAGCGGA G CGAUGCCC	737	GGGCAUCG GCCGAAAGGCGAGUCAAGGUCU UCCGCUAG	1322
2302	CCAACCAG G CGCAGAUG	738	CAUCUGCG GCCGAAAGGCGAGUCAAGGUCU CUGGUUGG	1323
2331	GAGACGGA G CUGAGGAA	739	UUCCUCAG GCCGAAAGGCGAGUCAAGGUCU UCCGUCUC	1324
2341	UGAGGAAG G UGAAGGUG	740	CACCUUCA GCCGAAAGGCGAGUCAAGGUCU CUUCCUCA	1325
2347	AGGUGAAG G UGCUUGGA	741	UCCAAGCA GCCGAAAGGCGAGUCAAGGUCU CUUCACCU	1326
2360	UGGAUCUG G CGCUUUUG	742	CAAAAGCG GCCGAAAGGCGAGUCAAGGUCU CAGAUCCA	1327
2369	CGCUUUUG G CACAGUCU	743	AGACUGUG GCCGAAAGGCGAGUCAAGGUCU CAAAAGCG	1328
2374	UUGGCACA G UCUACAAG	744	CUUGUAGA GCCGAAAGGCGAGUCAAGGUCU UGUGCCAA	1329
2384	CUACAAGG G CAUCUGGA	745	UCCAGAUG GCCGAAAGGCGAGUCAAGGUCU CCUUGUAG	1330
2422	AAAUUCCA G UGGCCAUC	746	GAUGGCCA GCCGAAAGGCGAGUCAAGGUCU UGGAAUUU	1331
2425	UUCCAGUG G CCAUCAAA	747	UUUGAUGG GCCGAAAGGCGAGUCAAGGUCU CACUGGAA	1332
2434	CCAUCAAA G UGUUGAGG	748	CCUCAACA GCCGAAAGGCGAGUCAAGGUCU UUUGAUGG	1333
2461	CCCCCAAA G CCAACAAA	749	UUUGUUGG GCCGAAAGGCGAGUCAAGGUCU UUUGGGGG	1334
2485	UAGACGAA G CAUACGUG	750	CACGUAUG GCCGAAAGGCGAGUCAAGGUCU UUCGUCUA	1335
2491	AAGCAUAC G UGAUGGCU	751	AGCCAUCA GCCGAAAGGCGAGUCAAGGUCU GUAUGCUU	1336
2497	ACGUGAUG G CUGGUGUG	752	CACACCAG GCCGAAAGGCGAGUCAAGGUCU CAUCACGU	1337
2501	GAUGGCUG G UGUGGGCU	753	AGCCCACA GCCGAAAGGCGAGUCAAGGUCU CAGCCAUC	1338
2507	UGGUGUGG G CUCCCCAU	754	AUGGGGAG GCCGAAAGGCGAGUCAAGGUCU CCACACCA	1339
2534	CCUUCUGG G CAUCUGCC	755	GGCAGAUG GCCGAAAGGCGAGUCAAGGUCU CCAGAAGG	1340
2554	CAUCCACG G UGCAGCUG	756	CAGCUGCA GCCGAAAGGCGAGUCAAGGUCU CGUGGAUG	1341
2559	ACGGUGCA G CUGGUGAC	757	GUCACCAG GCCGAAAGGCGAGUCAAGGUCU UGCACCGU	1342
2563	UGCAGCUG G UGACACAG	758	CUGUGUCA GCCGAAAGGCGAGUCAAGGUCU CAGCUGCA	1343
2571	GUGACACA G CUUAUGCC	759	GGCAUAAG GCCGAAAGGCGAGUCAAGGUCU UGUGUCAC	1344
2585	GCCCUAUG G CUGCCUCU	760	AGAGGCAG GCCGAAAGGCGAGUCAAGGUCU CAUAGGGC	1345
2627	ACGCCUGG G CUCCCAGG	761	CCUGGGAG GCCGAAAGGCGAGUCAAGGUCU CCAGGCGU	1346
2649	CUGAACUG G UGUAUGCA	762	UGCAUACA GCCGAAAGGCGAGUCAAGGUCU CAGUUCAG	1347
2675	GGGGAUGA G CUACCUGG	763	CCAGGUAG GCCGAAAGGCGAGUCAAGGUCU UCAUCCCC	1348
2694	GAUGUGCG G CUCGUACA	764	UGUACGAG GCCGAAAGGCGAGUCAAGGUCU CGCACAUC	1349
2698	UGCGGCUC G UACACAGG	765	CCUGUGUA GCCGAAAGGCGAGUCAAGGUCU GAGCCGCA	1350
2713	GGGACUUG G CCGCUCGG	766	CCGAGCGG GCCGAAAGGCGAGUCAAGGUCU CAAGUCCC	1351
2725	CUCGGAAC G UGCUGGUC	767	GACCAGCA GCCGAAAGGCGAGUCAAGGUCU GUUCCGAG	1352
2731	ACGUGCUG G UCAAGAGU	768	ACUCUUGA GCCGAAAGGCGAGUCAAGGUCU CAGCACGU	1353
2738	GGUCAAGA G UCCCAACC	769	GGUUGGGA GCCGAAAGGCGAGUCAAGGUCU UCUUGACC	1354
2769	GACUUCGG G CUGGCUCG	770	CGAGCCAG GCCGAAAGGCGAGUCAAGGUCU CCGAAGUC	1355
2773	UCGGGCUG G CUCGGCUG	771	CAGCCGAG GCCGAAAGGCGAGUCAAGGUCU CAGCCCGA	1356
2778	CUGGCUCG G CUGCUGGA	772	UCCAGCAG GCCGAAAGGCGAGUCAAGGUCU CGAGCCAG	1357
2802	GAGACAGA G UACCAUGC	773	GCAUGGUA GCCGAAAGGCGAGUCAAGGUCU UCUGUCUC	1358
2819	AGAUGGGG G CAAGGUGC	774	GCACCUUG GCCGAAAGGCGAGUCAAGGUCU CCCCAUCU	1359
2824	GGGGCAAG G UGCCCAUC	775	GAUGGGCA GCCGAAAGGCGAGUCAAGGUCU CUUGCCCC	1360

Table 59

2835	CCCAUCAA G UGGAUGGC	776	GCCAUCCA GCCGAAAGGCGAGUCAAGGUCU UUGAUGGG	1361
2842	AGUGGAUG G CGCUGGAG	777	CUCCAGCG GCCGAAAGGCGAGUCAAGGUCU CAUCCACU	1362
2850	GCGCUGGA G UCCAUUCU	778	AGAAUGGA GCCGAAAGGCGAGUCAAGGUCU UCCAGCGC	1363
2865	CUCCGCCG G CGGUUCAC	779	GUGAACCG GCCGAAAGGCGAGUCAAGGUCU CGGCGGAG	1364
2868	CGCCGGCG G UUCACCCA	780	UGGGUGAA GCCGAAAGGCGAGUCAAGGUCU CGCCGGCG	1365
2882	CCACCAGA G UGAUGUGU	781	ACACAUCA GCCGAAAGGCGAGUCAAGGUCU UCUGGUGG	1366
2894	UGUGUGGA G UUAUGGUG	782	CACCAUAA GCCGAAAGGCGAGUCAAGGUCU UCCACACA	1367
2900	GAGUUAUG G UGUGACUG	783	CAGUCACA GCCGAAAGGCGAGUCAAGGUCU CAUAACUC	1368
2916	GUGUGGGA G CUGAUGAC	784	GUCAUCAG GCCGAAAGGCGAGUCAAGGUCU UCCCACAC	1369
2932	CUUUUGGG G CCAAACCU	785	AGGUUUGG GCCGAAAGGCGAGUCAAGGUCU CCCAAAAG	1370
2956	GGAUCCCA G CCCGGGAG	786	CUCCCGGG GCCGAAAGGCGAGUCAAGGUCU UGGGAUCC	1371
2991	AAGGGGGA G CGGCUGCC	787	GGCAGCCG GCCGAAAGGCGAGUCAAGGUCU UCCCCCUU	1372
2994	GGGGAGCG G CUGCCCCA	788	UGGGGCAG GCCGAAAGGCGAGUCAAGGUCU CGCUCCCC	1373
3003	CUGCCCCA G CCCCCCAU	789	AUGGGGGG GCCGAAAGGCGAGUCAAGGUCU UGGGGCAG	1374
3040	UGAUCAUG G UCAAAUGU	790	ACAUUUGA GCCGAAAGGCGAGUCAAGGUCU CAUGAUCA	1375
3072	GAAUGUCG G CCAAGAUU	791	AAUCUUGG GCCGAAAGGCGAGUCAAGGUCU CGACAUUC	1376
3087	UUCCGGGA G UUGGUGUC	792	GACACCAA GCCGAAAGGCGAGUCAAGGUCU UCCCGGAA	1377
3091	GGGAGUUG G UGUCUGAA	793	UUCAGACA GCCGAAAGGCGAGUCAAGGUCU CAACUCCC	1378
3112	CCCGCAUG G CCAGGGAC	794	GUCCCUGG GCCGAAAGGCGAGUCAAGGUCU CAUGCGGG	1379
3126	GACCCCCA G CGCUUUGU	795	ACAAAGCG GCCGAAAGGCGAGUCAAGGUCU UGGGGGUC	1380
3136	GCUUUGUG G UCAUCCAG	796	CUGGAUGA GCCGAAAGGCGAGUCAAGGUCU CACAAAGC	1381
3158	GGACUUGG G CCCAGCCA	797	UGGCUGGG GCCGAAAGGCGAGUCAAGGUCU CCAAGUCC	1382
3163	UGGGCCCA G CCAGUCCC	798	GGGACUGG GCCGAAAGGCGAGUCAAGGUCU UGGGCCCA	1383
3167	CCCAGCCA G UCCCUUGG	799	CCAAGGGA GCCGAAAGGCGAGUCAAGGUCU UGGCUGGG	1384
3179	CUUGGACA G CACCUUCU	800	AGAAGGUG GCCGAAAGGCGAGUCAAGGUCU UGUCCAAG	1385
3226	GGGACCUG G UGGAUGCU	801	AGCAUCCA GCCGAAAGGCGAGUCAAGGUCU CAGGUCCC	1386
3240	GCUGAGGA G UAUCUGGU	802	ACCAGAUA GCCGAAAGGCGAGUCAAGGUCU UCCUCAGC	1387
3247	AGUAUCUG G UACCCCAG	803	CUGGGGUA GCCGAAAGGCGAGUCAAGGUCU CAGAUACU	1388
3255	GUACCCCA G CAGGGCUU	804	AAGCCCUG GCCGAAAGGCGAGUCAAGGUCU UGGGGUAC	1389
3260	CCAGCAGG G CUUCUUCU	805	AGAAGAAG GCCGAAAGGCGAGUCAAGGUCU CCUGCUGG	1390
3287	UGCCCCGG G CGCUGGGG	806	CCCCAGCG GCCGAAAGGCGAGUCAAGGUCU CCGGGGCA	1391
3296	CGCUGGGG G CAUGGUCC	807	GGACCAUG GCCGAAAGGCGAGUCAAGGUCU CCCCAGCG	1392
3301	GGGGCAUG G UCCACCAC	808	GUGGUGGA GCCGAAAGGCGAGUCAAGGUCU CAUGCCCC	1393
3312	CACCACAG G CACCGCAG	809	CUGCGGUG GCCGAAAGGCGAGUCAAGGUCU CUGUGGUG	1394
3320	GCACCGCA G CUCAUCUA	810	UAGAUGAG GCCGAAAGGCGAGUCAAGGUCU UGCGGUGC	1395
3335	UACCAGGA G UGGCGGUG	811	CACCGCCA GCCGAAAGGCGAGUCAAGGUCU UCCUGGUA	1396
3338	CAGGAGUG G CGGUGGGG	812	CCCCACCG GCCGAAAGGCGAGUCAAGGUCU CACUCCUG	1397
3341	GAGUGGCG G UGGGGACC	813	GGUCCCCA GCCGAAAGGCGAGUCAAGGUCU CGCCACUC	1398
3360	ACACUAGG G CUGGAGCC	814	GGCUCCAG GCCGAAAGGCGAGUCAAGGUCU CCUAGUGU	1399
3366	GGGCUGGA G CCCUCUGA	815	UCAGAGGG GCCGAAAGGCGAGUCAAGGUCU UCCAGCCC	1400
3382	AAGAGGAG G CCCCCAGG	816	CCUGGGGG GCCGAAAGGCGAGUCAAGGUCU CUCCUCUU	1401
3390	GCCCCCAG G UCUCCACU	817	AGUGGAGA GCCGAAAGGCGAGUCAAGGUCU CUGGGGGC	1402
3400	CUCCACUG G CACCCUCC	818	GGAGGGUG GCCGAAAGGCGAGUCAAGGUCU CAGUGGAG	1403
3415	CCGAAGGG G CUGGCUCC	819	GGAGCCAG GCCGAAAGGCGAGUCAAGGUCU CCCUUCGG	1404
3419	AGGGGCUG G CUCCGAUG	820	CAUCGGAG GCCGAAAGGCGAGUCAAGGUCU CAGCCCCU	1405
3437	AUUUGAUG G UGACCUGG	821	CCAGGUCA GCCGAAAGGCGAGUCAAGGUCU CAUCAAAU	1406
3454	GAAUGGGG G CAGCCAAG	822	CUUGGCUG GCCGAAAGGCGAGUCAAGGUCU CCCCAUUC	1407

Table 59

3457	UGGGGGCA G CCAAGGGG	823	CCCCUUGG GCCGAAAGGCGAGUCAAGGUCU UGCCCCCA	1408
3465	GCCAAGGG G CUGCAAAG	824	CUUUGCAG GCCGAAAGGCGAGUCAAGGUCU CCCUUGGC	1409
3473	GCUGCAAA G CCUCCCCA	825	UGGGGAGG GCCGAAAGGCGAGUCAAGGUCU UUUGCAGC	1410
3494	UGACCCCA G CCCUCUAC	826	GUAGAGGG GCCGAAAGGCGAGUCAAGGUCU UGGGGUCA	1411
3504	CCUCUACA G CGGUACAG	827	CUGUACCG GCCGAAAGGCGAGUCAAGGUCU UGUAGAGG	1412
3507	CUACAGCG G UACAGUGA	828	UCACUGUA GCCGAAAGGCGAGUCAAGGUCU CGCUGUAG	1413
3512	GCGGUACA G UGAGGACC	829	GGUCCUCA GCCGAAAGGCGAGUCAAGGUCU UGUACCGC	1414
3526	ACCCCACA G UACCCCUG	830	CAGGGGUA GCCGAAAGGCGAGUCAAGGUCU UGUGGGGU	1415
3551	GACUGAUG G CUACGUUG	831	CAACGUAG GCCGAAAGGCGAGUCAAGGUCU CAUCAGUC	1416
3556	AUGGCUAC G UUGCCCCC	832	GGGGGCAA GCCGAAAGGCGAGUCAAGGUCU GUAGCCAU	1417
3575	GACCUGCA G CCCCCAGC	833	GCUGGGGG GCCGAAAGGCGAGUCAAGGUCU UGCAGGUC	1418
3582	AGCCCCCA G CCUGAAUA	834	UAUUCAGG GCCGAAAGGCGAGUCAAGGUCU UGGGGGCU	1419
3600	GUGAACCA G CCAGAUGU	835	ACAUCUGG GCCGAAAGGCGAGUCAAGGUCU UGGUUCAC	1420
3612	GAUGUUCG G CCCCAGCC	836	GGCUGGGG GCCGAAAGGCGAGUCAAGGUCU CGAACAUC	1421
3618	CGGCCCCA G CCCCCUUC	837	GAAGGGGG GCCGAAAGGCGAGUCAAGGUCU UGGGGCCG	1422
3638	CCGAGAGG G CCCUCUGC	838	GCAGAGGG GCCGAAAGGCGAGUCAAGGUCU CCUCUCGG	1423
3665	ACCUGCUG G UGCCACUC	839	GAGUGGCA GCCGAAAGGCGAGUCAAGGUCU CAGCAGGU	1424
3681	CUGGAAAG G CCCAAGAC	840	GUCUUGGG GCCGAAAGGCGAGUCAAGGUCU CUUUCCAG	1425
3712	AGAAUGGG G UCGUCAAA	841	UUUGACGA GCCGAAAGGCGAGUCAAGGUCU CCCAUUCU	1426
3715	AUGGGGUC G UCAAAGAC	842	GUCUUUGA GCCGAAAGGCGAGUCAAGGUCU GACCCCAU	1427
3724	UCAAAGAC G UUUUUGCC	843	GGCAAAAA GCCGAAAGGCGAGUCAAGGUCU GUCUUUGA	1428
3740	CUUUGGGG G UGCCGUGG	844	CCACGGCA GCCGAAAGGCGAGUCAAGGUCU CCCCAAAG	1429
3745	GGGGUGCC G UGGAGAAC	845	GUUCUCCA GCCGAAAGGCGAGUCAAGGUCU GGCACCCC	1430
3759	AACCCCGA G UACUUGAC	846	GUCAAGUA GCCGAAAGGCGAGUCAAGGUCU UCGGGGUU	1431
3781	AGGGAGGA G CUGCCCCU	847	AGGGGCAG GCCGAAAGGCGAGUCAAGGUCU UCCUCCCU	1432
3792	GCCCCUCA G CCCCACCC	848	GGGUGGGG GCCGAAAGGCGAGUCAAGGUCU UGAGGGGC	1433
3815	UGCCUUCA G CCCAGCCU	849	AGGCUGGG GCCGAAAGGCGAGUCAAGGUCU UGAAGGCA	1434
3820	UCAGCCCA G CCUUCGAC	850	GUCGAAGG GCCGAAAGGCGAGUCAAGGUCU UGGGCUGA	1435
3861	CCACCAGA G CGGGGGGC	851	GCCCCCCG GCCGAAAGGCGAGUCAAGGUCU UCUGGUGG	1436
3868	AGCGGGGG G CUCCACCC	852	GGGUGGAG GCCGAAAGGCGAGUCAAGGUCU CCCCCGCU	1437
3878	UCCACCCA G CACCUUCA	853	UGAAGGUG GCCGAAAGGCGAGUCAAGGUCU UGGGUGGA	1438
3901	CACCUACG G CAGAGAAC	854	GUUCUCUG GCCGAAAGGCGAGUCAAGGUCU CGUAGGUG	1439
3915	AACCCAGA G UACCUGGG	855	CCCAGGUA GCCGAAAGGCGAGUCAAGGUCU UCUGGGUU	1440
3923	GUACCUGG G UCUGGACG	856	CGUCCAGA GCCGAAAGGCGAGUCAAGGUCU CCAGGUAC	1441
3931	GUCUGGAC G UGCCAGUG	857	CACUGGCA GCCGAAAGGCGAGUCAAGGUCU GUCCAGAC	1442
3937	ACGUGCCA G UGUGAACC	858	GGUUCACA GCCGAAAGGCGAGUCAAGGUCU UGGCACGU	1443
3951	ACCAGAAG G CCAAGUCC	859	GGACUUGG GCCGAAAGGCGAGUCAAGGUCU CUUCUGGU	1444
3956	AAGGCCAA G UCCGCAGA	860	UCUGCGGA GCCGAAAGGCGAGUCAAGGUCU UUGGCCUU	1445
3966	CCGCAGAA G CCCUGAUG	861	CAUCAGGG GCCGAAAGGCGAGUCAAGGUCU UUCUGCGG	1446
3987	CUCAGGGA G CAGGGAAG	862	CUUCCCUG GCCGAAAGGCGAGUCAAGGUCU UCCCUGAG	1447
3996	CAGGGAAG G CCUGACUU	863	AAGUCAGG GCCGAAAGGCGAGUCAAGGUCU CUUCCCUG	1448
4011	UUCUGCUG G CAUCAAGA	864	UCUUGAUG GCCGAAAGGCGAGUCAAGGUCU CAGCAGAA	1449
4021	AUCAAGAG G UGGGAGGG	865	CCCUCCCA GCCGAAAGGCGAGUCAAGGUCU CUCUUGAU	1450
4029	GUGGGAGG G CCCUCCGA	866	UCGGAGGG GCCGAAAGGCGAGUCAAGGUCU CCUCCCAC	1451
4100	CUGCUUGA G UUCCCAGA	867	UCUGGGAA GCCGAAAGGCGAGUCAAGGUCU UCAAGCAG	1452
4111	CCCAGAUG G CUGGAAGG	868	CCUUCCAG GCCGAAAGGCGAGUCAAGGUCU CAUCUGGG	1453
4121	UGGAAGGG G UCCAGCCU	869	AGGCUGGA GCCGAAAGGCGAGUCAAGGUCU CCCUUCCA	1454

Table 59

4126	GGGGUCCA G CCUCGUUG	870	CAACGAGG GCCGAAAGGCGAGUCAAGGUCU UGGACCCC	1455
4131	CCAGCCUC G UUGGAAGA	871	UCUUCCAA GCCGAAAGGCGAGUCAAGGUCU GAGGCUGG	1456
4146	GAGGAACA G CACUGGGG	872	CCCCAGUG GCCGAAAGGCGAGUCAAGGUCU UGUUCCUC	1457
4156	ACUGGGGA G UCUUUGUG	873	CACAAAGA GCCGAAAGGCGAGUCAAGGUCU UCCCCAGU	1458
4174	AUUCUGAG G CCCUGCCC	874	GGGCAGGG GCCGAAAGGCGAGUCAAGGUCU CUCAGAAU	1459
4197	ACUCUAGG G UCCAGUGG	875	CCACUGGA GCCGAAAGGCGAGUCAAGGUCU CCUAGAGU	1460
4202	AGGGUCCA G UGGAUGCC	876	GGCAUCCA GCCGAAAGGCGAGUCAAGGUCU UGGACCCU	1461
4214	AUGCCACA G CCCAGCUU	877	AAGCUGGG GCCGAAAGGCGAGUCAAGGUCU UGUGGCAU	1462
4219	ACAGCCCA G CUUGGCCC	878	GGGCCAAG GCCGAAAGGCGAGUCAAGGUCU UGGGCUGU	1463
4224	CCAGCUUG G CCCUUUCC	879	GGAAAGGG GCCGAAAGGCGAGUCAAGGUCU CAAGCUGG	1464
4246	GAUCCUGG G UACUGAAA	880	UUUCAGUA GCCGAAAGGCGAGUCAAGGUCU CCAGGAUC	1465
4255	UACUGAAA G CCUUAGGG	881	CCCUAAGG GCCGAAAGGCGAGUCAAGGUCU UUUCAGUA	1466
4266	UUAGGGAA G CUGGCCUG	882	CAGGCCAG GCCGAAAGGCGAGUCAAGGUCU UUCCCUAA	1467
4270	GGAAGCUG G CCUGAGAG	883	CUCUCAGG GCCGAAAGGCGAGUCAAGGUCU CAGCUUCC	1468
4284	GAGGGGAA G CGGCCCUA	884	UAGGGCCG GCCGAAAGGCGAGUCAAGGUCU UUCCCCUC	1469
4287	GGGAAGCG G CCCUAAGG	885	CCUUAGGG GCCGAAAGGCGAGUCAAGGUCU CGCUUCCC	1470
4298	CUAAGGGA G UGUCUAAG	886	CUUAGACA GCCGAAAGGCGAGUCAAGGUCU UCCCUUAG	1471
4314	GAACAAAA G CGACCCAU	887	AUGGGUCG GCCGAAAGGCGAGUCAAGGUCU UUUUGUUC	1472
4346	GAAACCUA G UACUGCCC	888	GGGCAGUA GCCGAAAGGCGAGUCAAGGUCU UAGGUUUC	1473
4372	AAGGAACA G CAAUGGUG	889	CACCAUUG GCCGAAAGGCGAGUCAAGGUCU UGUUCCUU	1474
4378	CAGCAAUG G UGUCAGUA	890	UACUGACA GCCGAAAGGCGAGUCAAGGUCU CAUUGCUG	1475
4384	UGGUGUCA G UAUCCAGG	891	CCUGGAUA GCCGAAAGGCGAGUCAAGGUCU UGACACCA	1476
4392	GUAUCCAG G CUUUGUAC	892	GUACAAAG GCCGAAAGGCGAGUCAAGGUCU CUGGAUAC	1477
4404	UGUACAGA G UGCUUUUC	893	GAAAAGCA GCCGAAAGGCGAGUCAAGGUCU UCUGUACA	1478
4419	UCUGUUUA G UUUUUACU	894	AGUAAAAA GCCGAAAGGCGAGUCAAGGUCU UAAACAGA	1479

Input Sequence = HSERB2R. Cut Site = G/Y
Stem Length = 8 . Core Sequence = GCcgaaagGCGaGuCaaGGuCu
HSERB2R (Human c-erb-B-2 mRNA; 4473 bp)

Table 60

Table 60: Substrate Specificity for Class I Ribozymes

Substrate sequence	1-9t mutation	k_{rel}
5'-GCCGU G GGUUGCAC ACCUUUCC-3'	w.t.	1.00
5'-GCCG**U** G GGUUGCAC ACCUUUCC-3'	A57G	2.5
5'-GCCG**A** G GGUUGCAC ACCUUUCC-3'	A57U	0.24
5'-GCCG**C** G GGUUGCAC ACCUUUCC-3'	A57G	0.66
5'-GCCG**G** G GGUUGCAC ACCUUUCC-3'	A57C	0.57
5'-GCCGU **U** GGUUGCAC ACCUUUCC-3'	w.t	0.17
5'-GCCGU **A** GGUUGCAC ACCUUUCC-3'	w.t.	n.d.
5'-GCCGU **C** GGUUGCAC ACCUUUCC-3'	w.t.	n.d.
5'-GCCGU G GGUUGCAC ACCUUUCC-3'	C16U	0.98
5'-GCCGU G **U**GUUGCAC ACCUUUCC-3'	C16G	n.d.
5'-GCCGU G **U**GUUGCAC ACCUUUCC-3'	C16A	0.65
5'-GCCGU G **A**GUUGCAC ACCUUUCC-3'	C16U	0.45
5'-GCCGU G **C**GUUGCAC ACCUUUCC-3'	C16G	0.73
5'-GCCGU G GGUUGCAC ACCUUU-3'	w.t.	0.89
5'-GCCGU G GGUUGCAC ACCU-3'	w.t.	1.0
5'-GCCGU G GGUUGCAC AC-3'	w.t.	0.67

Table 61

Table 61: Random region alignments/mutations for Class I ribozyme

Random region alignments/mutations																																										
	position																																									
clone (#'s)	17			20										30										40										50						56	Krel
1-9 motif (42)	G	G	U	G	U	C	A	U	C	A	U	A	.	A	U	G	G	C	A	C	C	C	U	U	C	A	A	G	G	A	C	A	U	C	G	U	C	C	G	G	G	1.01
1.1 (39)			*A*																*U*																							0.89
1.6																																		A								1.06
1.27			*A*		C														*U*																							0.95
1.14 (8)																	A																									0.82
1.16 (5)			*A*								C								*U*																							0.66
1.20.			*A*		A														*U*									A														0.61
1.24													U	G																												0.75
1.30.			*A*																*U*															U								0.81
2.1					C			C																																		0.24
2.13			*A*																*U*											G												0.19
2.18 (3)			*A*																A																							0.02
2.34																	A					A																				0.62
2.21															C		A						C																			0.25
2.23 (2)										U																																0.9
2.27			*A*		C		G												*U*																							0.78
2.31																																		U								1.1
2.35			*A*		C			C											*U*																							0.84
2.36			*A*																*U*				A																			0.31
2.38 (2)			*A*											G					*U*																							0.81
2.45 (2)			*A*					C											*U*																							0.36
3.3								C						G																												0.6
3.6								A									A																									1.11
3.7			*A*					C									A		*U*																							0.98
3.9																																					U					0.86
3.26			*A*			-		C											*U*																							1.51
3.27 (2)																			U																							0.22
3.28 (2)										G																																1.1
4.13 (3)			*A*														A		*U*																							0.95
4.19																							A																			0.44
4.34 (2)			*A*																*U*				C																			0.27
4.38 (3)																																	C									0.97
			mutation maintains base pair																																							

Table 62

Table 62: Human Her2 Class II Ribozyme and Target Sequence

RPI#	NT Pos	Substrate	Seq ID #	Ribozyme Sequence	Seq ID #
19952	433	GCUCAUC G CUCACAA	7	$u_s u_s g_s u_s$gag gccgaaaggCgagugagguCu gaugagc B	1480
19953	433	GCUCAUC G CUCACAA	7	$u_s u_s g_s u_s$gag gccgaaaggCGagugaGGuCu gaugagc B	1481
19950	934	CUGCCUG G CCUGCCU	22	$a_s g_s g_s c_s$agg gccgaaaggCgagugagguCu caggcag B	1482
19951	934	CUGCCUG G CCUGCCU	22	$a_s g_s g_s c_s$agg gccgaaaggCGagugaGGuCu caggcag B	1483
19729	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaaggCGagugaGGuCu agcuca B	1484
19730	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaagGCGagugaGGuCu agcuca B	1485
19731	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaagGCGaGugaGGuCu agcuca B	1486
20315	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$uaag gccgaaaggCgagugaGGuCu agcucaug B	1487
20668	972	UGAGCU G CACUGC	27	$g_s c_s a_s$ $g_s$uu uaa ggc cga aag gCgagu gaG GuC uag cuc aug uuB	1488
20695	972	UGAGCU G CACUGC	27	$g_s c_s a_s$ $g_s u_s u_s$ $u_s$ua agg ccg aaa gGC gag uga GGu Cua gcu cau guu uB	1489
20696	972	UGAGCU G CACUGC	27	$g_s c_s a_s$ $g_s u_s u_s$ $u_s u_s$a aaggcc gaa aggCgagug aGG uCu agc uca uga uuu B	1490
20719	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaaggCgagugaGguCu agcuca B	1491
20720	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gcc P ggCgagugaGguCu agcuca B	1492
20721	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gc P gCgagugaGguCu agcuca B	1493
20770	972	UGAGCU G CACUGC	27	$g_s c_s a_s$ $g_s u_s u_s$ $u_s u_s a_s$ $a_s$ag gcc gaa agg Cga gug aGG uCu agc uca uga uuu B	1494
20771	972	UGAGCU G CACUGC	27	$g_s c_s a_s$ $g_s u_s u_s$ $u_s u_s a_s$ $a_s a_s g$ $_s$gcc gaa agg Cga gug aGG uCu agc uca uga uuu B	1495
20868	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccguuaggCgagugaGGuCu agcuca B	1496
20869	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug GccgaaagGCGaGuGaGGuCu agcuca B	1497
20870	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug GccgaaagGCGaGuGaGGuCu agcuca B	1498
20871	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug GccgaaagGCGaGuGaGGuCu agcuca B	1499
20872	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaaggCgagugaGGuCu agcuca B	1500
20873	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaaggCgagugaGGuCu agcuca B	1501
20874	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaaggCgagugaGGuCu agcuca B	1502
20875	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug gccgaaaggCgagugaGGuCu agcuca B	1503
21448	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug g cacc CgagugaGGuCu agcuca B	1504
21449	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug g uuuu CgagugaGGuCu agcuca B	1505
21450	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug g uuaa CgagugaGGuCu agcuca B	1506
21451	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug g ucca CgagugaGGuCu agcuca B	1507
21452	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug g ucua CgagugaGGuCu agcuca B	1508
21453	972	UGAGCU G CACUGC	27	$g_s c_s a_s g_s$ug g guaa CgagugaGGuCu agcuca B	1509

Table 62

21454	972	UGAGCU G CACUGC	27	$g_sc_sa_sg_s$ug g aau CgagugaGGuCu agcuca B	1510
21455	972	UGAGCU G CACUGC	27	$g_sc_sa_sg_s$ug g aag CgagugaGGuCu agcuca B	1511
21456	972	UGAGCU G CACUGC	27	$g_sc_sa_sg_s$ug g c aag g CgagugaGGuCu agcuca B	1512
21457	972	UGAGCU G CACUGC	27	$g_sc_sa_sg_s$ug g cc aag gg CgagugaGGuCu agcuca B	1513
21458	972	UGAGCU G CACUGC	27	$g_sc_sa_sg_s$ug g cc guua gg CgagugaGGuCu agcuca B	1514
21459	972	UGAGCU G CACUGC	27	$g_sc_sa_sg_s$ug g cc guua gg C agugaGGuCu agcuca B	1515
19954	1292	UUGGGA G CCUGGC	34	$g_sc_sc_sa_s$gg gccgaaaggCgagugagguCu ucccaa B	1516
20628	1292	UUGGGA G CCUGGC	34	$g_sc_sc_sa_s$gg GccgaaagGCGaGuGaGGuCu ucccaa B	1517

lower case = 2'-O-methyl
U, C = 2'-deoxy-2'-amino U, = 2'-deoxy-2'-amino C
G,A = ribo G, A
B = inverted deoxyabasic
P= polyethylene glycol 18 (PEG 18) linker

Table 63

Table 63: Human PKCα NCH Ribozyme and Substrate Sequence

Pos	Substrate	Seq ID	Ribozyme	Rz Seq ID
27	GGGGGGAC C AUGGCUGA		UCAGCCAU CUGAUGAG X CGAA IUCCCCCC	
28	GGGGGACC A UGGCUGAC		GUCAGCCA CUGAUGAG X CGAA IGUCCCCC	
33	ACCAUGGC U GACGUUUU		AAAACGUC CUGAUGAG X CGAA ICCAUGGU	
43	ACGUUUUC C CGGGCAAC		GUUGCCCG CUGAUGAG X CGAA IAAAACGU	
44	CGUUUUCC C GGGCAACG		CGUUGCCC CUGAUGAG X CGAA IGAAAACG	
49	UCCCGGGC A ACGACUCC		GGAGUCGU CUGAUGAG X CGAA ICCCGGGA	
55	GCAACGAC U CCACGGCG		CGCCGUGG CUGAUGAG X CGAA IUCGUUGC	
57	AACGACUC C ACGGCGUC		GACGCCGU CUGAUGAG X CGAA IAGUCGUU	
58	ACGACUCC A CGGCGUCU		AGACGCCG CUGAUGAG X CGAA IGAGUCGU	
66	ACGGCGUC U CAGGACGU		ACGUCCUG CUGAUGAG X CGAA IACGCCGU	
68	GGCGUCUC A GGACGUGG		CCACGUCC CUGAUGAG X CGAA IAGACGCC	
78	GACGUGGC C AACCGCUU		AAGCGGUU CUGAUGAG X CGAA ICCACGUC	
79	ACGUGGCC A ACCGCUUC		GAAGCGGU CUGAUGAG X CGAA IGCCACGU	
82	UGGCCAAC C GCUUCGCC		GGCGAAGC CUGAUGAG X CGAA IUUGGCCA	
85	CCAACCGC U UCGCCCGC		GCGGGCGA CUGAUGAG X CGAA ICGGUUGG	
90	CGCUUCGC C CGCAAAGG		CCUUUGCG CUGAUGAG X CGAA ICGAAGCG	
91	GCUUCGCC C GCAAAGGG		CCCUUUGC CUGAUGAG X CGAA IGCGAAGC	
94	UCGCCCGC A AAGGGGCG		CGCCCCUU CUGAUGAG X CGAA ICGGGCGA	
104	AGGGGCGC U GAGGCAGA		UCUGCCUC CUGAUGAG X CGAA ICGCCCCU	
110	GCUGAGGC A GAAGAACG		CGUUCUUC CUGAUGAG X CGAA ICCUCAGC	
122	GAACGUGC A CGAGGUGA		UCACCUCG CUGAUGAG X CGAA ICACGUUC	
136	UGAAGGAC C ACAAAUUC		GAAUUUGU CUGAUGAG X CGAA IUCCUUCA	
137	GAAGGACC A CAAAUUCA		UGAAUUUG CUGAUGAG X CGAA IGUCCUUC	
139	AGGACCAC A AAUUCAUC		GAUGAAUU CUGAUGAG X CGAA IUGGUCCU	
145	ACAAAUUC A UCGCGCGC		GCGCGCGA CUGAUGAG X CGAA IAAUUUGU	
154	UCGCGCGC U UCUUCAAG		CUUGAAGA CUGAUGAG X CGAA ICGCGCGA	
157	CGCGCUUC U UCAAGCAG		CUGCUUGA CUGAUGAG X CGAA IAAGCGCG	
160	GCUUCUUC A AGCAGCCC		GGGCUGCU CUGAUGAG X CGAA IAAGAAGC	
164	CUUCAAGC A GCCCACCU		AGGUGGGC CUGAUGAG X CGAA ICUUGAAG	
167	CAAGCAGC C CACCUUCU		AGAAGGUG CUGAUGAG X CGAA ICUGCUUG	
168	AAGCAGCC C ACCUUCUG		CAGAAGGU CUGAUGAG X CGAA IGCUGCUU	
169	AGCAGCCC A CCUUCUGC		GCAGAAGG CUGAUGAG X CGAA IGGCUGCU	
171	CAGCCCAC C UUCUGCAG		CUGCAGAA CUGAUGAG X CGAA IUGGGCUG	
172	AGCCCACC U UCUGCAGC		GCUGCAGA CUGAUGAG X CGAA IGUGGGCU	
175	CCACCUUC U GCAGCCAC		GUGGCUGC CUGAUGAG X CGAA IAAGGUGG	
178	CCUUCUGC A GCCACUGC		GCAGUGGC CUGAUGAG X CGAA ICAGAAGG	
181	UCUGCAGC C ACUGCACC		GGUGCAGU CUGAUGAG X CGAA ICUGCAGA	
182	CUGCAGCC A CUGCACCG		CGGUGCAG CUGAUGAG X CGAA IGCUGCAG	
184	GCAGCCAC U GCACCGAC		GUCGGUGC CUGAUGAG X CGAA IUGGCUGC	
187	GCCACUGC A CCGACUUC		GAAGUCGG CUGAUGAG X CGAA ICAGUGGC	
189	CACUGCAC C GACUUCAU		AUGAAGUC CUGAUGAG X CGAA IUGCAGUG	
193	GCACCGAC U UCAUCUGG		CCAGAUGA CUGAUGAG X CGAA IUCGGUGC	
196	CCGACUUC A UCUGGGGG		CCCCCAGA CUGAUGAG X CGAA IAAGUCGG	
199	ACUUCAUC U GGGGGUUU		AAACCCCC CUGAUGAG X CGAA IAUGAAGU	
215	UGGGAAAC A AGGCUUCC		GGAAGCCU CUGAUGAG X CGAA IUUUCCCA	
220	AACAAGGC U UCCAGUGC		GCACUGGA CUGAUGAG X CGAA ICCUUGUU	
223	AAGGCUUC C AGUGCCAA		UUGGCACU CUGAUGAG X CGAA IAAGCCUU	

Table 63

224	AGGCUUCC A GUGCCAAG		CUUGGCAC CUGAUGAG X CGAA IGAAGCCU	
229	UCCAGUGC C AAGUUUGC		GCAAACUU CUGAUGAG X CGAA ICACUGGA	
230	CCAGUGCC A AGUUUGCU		AGCAAACU CUGAUGAG X CGAA IGCACUGG	
238	AAGUUUGC U GUUUUGUG		CACAAAAC CUGAUGAG X CGAA ICAAACUU	
250	UUGUGGUC C ACAAGAGG		CCUCUUGU CUGAUGAG X CGAA IACCACAA	
251	UGUGGUCC A CAAGAGGU		ACCUCUUG CUGAUGAG X CGAA IGACCACA	
253	UGGUCCAC A AGAGGUGC		GCACCUCU CUGAUGAG X CGAA IUGGACCA	
262	AGAGGUGC C AUGAAUUU		AAAUUCAU CUGAUGAG X CGAA ICACCUCU	
263	GAGGUGCC A UGAAUUUG		CAAAUUCA CUGAUGAG X CGAA IGCACCUC	
276	UUUGUUAC U UUUUCUUG		CAAGAAAA CUGAUGAG X CGAA IUAACAAA	
282	ACUUUUUC U UGUCCGGG		CCCGGACA CUGAUGAG X CGAA IAAAAAGU	
287	UUCUUGUC C GGGUGCGG		CCGCACCC CUGAUGAG X CGAA IACAAGAA	
305	UAAGGGAC C CGACACUG		CAGUGUCG CUGAUGAG X CGAA IUCCCUUA	
306	AAGGGACC C GACACUGA		UCAGUGUC CUGAUGAG X CGAA IGUCCCUU	
310	GACCCGAC A CUGAUGAC		GUCAUCAG CUGAUGAG X CGAA IUCGGGUC	
312	CCCGACAC U GAUGACCC		GGGUCAUC CUGAUGAG X CGAA IUGUCGGG	
319	CUGAUGAC C CCAGGAGC		GCUCCUGG CUGAUGAG X CGAA IUCAUCAG	
320	UGAUGACC C CAGGAGCA		UGCUCCUG CUGAUGAG X CGAA IGUCAUCA	
321	GAUGACCC C AGGAGCAA		UUGCUCCU CUGAUGAG X CGAA IGGUCAUC	
322	AUGACCCC A GGAGCAAG		CUUGCUCC CUGAUGAG X CGAA IGGGUCAU	
328	CCAGGAGC A AGCACAAG		CUUGUGCU CUGAUGAG X CGAA ICUCCUGG	
332	GAGCAAGC A CAAGUUCA		UGAACUUG CUGAUGAG X CGAA ICUUGCUC	
334	GCAAGCAC A AGUUCAAA		UUUGAACU CUGAUGAG X CGAA IUGCUUGC	
340	ACAAGUUC A AAAUCCAC		GUGGAUUU CUGAUGAG X CGAA IAACUUGU	
346	UCAAAAUC C ACACUUAC		GUAAGUGU CUGAUGAG X CGAA IAUUUUGA	
347	CAAAAUCC A CACUUACG		CGUAAGUG CUGAUGAG X CGAA IGAUUUUG	
349	AAAUCCAC A CUUACGGA		UCCGUAAG CUGAUGAG X CGAA IUGGAUUU	
351	AUCCACAC U UACGGAAG		CUUCCGUA CUGAUGAG X CGAA IUGUGGAU	
361	ACGGAAGC C CCACCUUC		GAAGGUGG CUGAUGAG X CGAA ICUUCCGU	
362	CGGAAGCC C CACCUUCU		AGAAGGUG CUGAUGAG X CGAA IGCUUCCG	
363	GGAAGCCC C ACCUUCUG		CAGAAGGU CUGAUGAG X CGAA IGGCUUCC	
364	GAAGCCCC A CCUUCUGC		GCAGAAGG CUGAUGAG X CGAA IGGGCUUC	
366	AGCCCCAC C UUCUGCGA		UCGCAGAA CUGAUGAG X CGAA IUGGGGCU	
367	GCCCCACC U UCUGCGAU		AUCGCAGA CUGAUGAG X CGAA IGUGGGGC	
370	CCACCUUC U GCGAUCAC		GUGAUCGC CUGAUGAG X CGAA IAAGGUGG	
377	CUGCGAUC A CUGUGGGU		ACCCACAG CUGAUGAG X CGAA IAUCGCAG	
379	GCGAUCAC U GUGGGUCA		UGACCCAC CUGAUGAG X CGAA IUGAUCGC	
387	UGUGGGUC A CUGCUCUA		UAGAGCAG CUGAUGAG X CGAA IACCCACA	
389	UGGGUCAC U GCUCUAUG		CAUAGAGC CUGAUGAG X CGAA IUGACCCA	
392	GUCACUGC U CUAUGGAC		GUCCAUAG CUGAUGAG X CGAA ICAGUGAC	
394	CACUGCUC U AUGGACUU		AAGUCCAU CUGAUGAG X CGAA IAGCAGUG	
401	CUAUGGAC U UAUCCAUC		GAUGGAUA CUGAUGAG X CGAA IUCCAUAG	
406	GACUUAUC C AUCAAGGG		CCCUUGAU CUGAUGAG X CGAA IAUAAGUC	
407	ACUUAUCC A UCAAGGGA		UCCCUUGA CUGAUGAG X CGAA IGAUAAGU	
410	UAUCCAUC A AGGGAUGA		UCAUCCCU CUGAUGAG X CGAA IAUGGAUA	
427	AAUGUGAC A CCUGCGAU		AUCGCAGG CUGAUGAG X CGAA IUCACAUU	
429	UGUGACAC C UGCGAUAU		AUAUCGCA CUGAUGAG X CGAA IUGUCACA	
430	GUGACACC U GCGAUAUG		CAUAUCGC CUGAUGAG X CGAA IGUGUCAC	
446	GAACGUUC A CAAGCAAU		AUUGCUUG CUGAUGAG X CGAA IAACGUUC	
448	ACGUUCAC A AGCAAUGC		GCAUUGCU CUGAUGAG X CGAA IUGAACGU	
452	UCACAAGC A AUGCGUCA		UGACGCAU CUGAUGAG X CGAA ICUUGUGA	

Table 63

460	AAUGCGUC A UCAAUGUC		GACAUUGA CUGAUGAG X CGAA IACGCAUU	
463	GCGUCAUC A AUGUCCCC		GGGGACAU CUGAUGAG X CGAA IAUGACGC	
469	UCAAUGUC C CCAGCCUC		GAGGCUGG CUGAUGAG X CGAA IACAUUGA	
470	CAAUGUCC C CAGCCUCU		AGAGGCUG CUGAUGAG X CGAA IGACAUUG	
471	AAUGUCCC C AGCCUCUG		CAGAGGCU CUGAUGAG X CGAA IGGACAUU	
472	AUGUCCCC A GCCUCUGC		GCAGAGGC CUGAUGAG X CGAA IGGGACAU	
475	UCCCCAGC C UCUGCGGA		UCCGCAGA CUGAUGAG X CGAA ICUGGGGA	
476	CCCCAGCC U CUGCGGAA		UUCCGCAG CUGAUGAG X CGAA IGCUGGGG	
478	CCAGCCUC U GCGGAAUG		CAUUCCGC CUGAUGAG X CGAA IAGGCUGG	
491	AAUGGAUC A CACUGAGA		UCUCAGUG CUGAUGAG X CGAA IAUCCAUU	
493	UGGAUCAC A CUGAGAAG		CUUCUCAG CUGAUGAG X CGAA IUGAUCCA	
495	GAUCACAC U GAGAAGAG		CUCUUCUC CUGAUGAG X CGAA IUGUGAUC	
517	GGAUUUAC C UAAAGGCU		AGCCUUUA CUGAUGAG X CGAA IUAAAUCC	
518	GAUUUACC U AAAGGCUG		CAGCCUUU CUGAUGAG X CGAA IGUAAAUC	
525	CUAAAGGC U GAGGUUGC		GCAACCUC CUGAUGAG X CGAA ICCUUUAG	
534	GAGGUUGC U GAUGAAAA		UUUUCAUC CUGAUGAG X CGAA ICAACCUC	
545	UGAAAAGC U CCAUGUCA		UGACAUGG CUGAUGAG X CGAA ICUUUUCA	
547	AAAAGCUC C AUGUCACA		UGUGACAU CUGAUGAG X CGAA IAGCUUUU	
548	AAAGCUCC A UGUCACAG		CUGUGACA CUGAUGAG X CGAA IGAGCUUU	
553	UCCAUGUC A CAGUACGA		UCGUACUG CUGAUGAG X CGAA IACAUGGA	
555	CAUGUCAC A GUACGAGA		UCUCGUAC CUGAUGAG X CGAA IUGACAUG	
567	CGAGAUGC A AAAAAUCU		AGAUUUUU CUGAUGAG X CGAA ICAUCUCG	
575	AAAAAAUC U AAUCCCUA		UAGGGAUU CUGAUGAG X CGAA IAUUUUUU	
580	AUCUAAUC C CUAUGGAU		AUCCAUAG CUGAUGAG X CGAA IAUUAGAU	
581	UCUAAUCC C UAUGGAUC		GAUCCAUA CUGAUGAG X CGAA IGAUUAGA	
582	CUAAUCCC U AUGGAUCC		GGAUCCAU CUGAUGAG X CGAA IGGAUUAG	
590	UAUGGAUC C AAACGGGC		GCCCGUUU CUGAUGAG X CGAA IAUCCAUA	
591	AUGGAUCC A AACGGGCU		AGCCCGUU CUGAUGAG X CGAA IGAUCCAU	
599	AAACGGGC U UUCAGAUC		GAUCUGAA CUGAUGAG X CGAA ICCCGUUU	
603	GGGCUUUC A GAUCCUUA		UAAGGAUC CUGAUGAG X CGAA IAAAGCCC	
608	UUCAGAUC C UUAUGUGA		UCACAUAA CUGAUGAG X CGAA IAUCUGAA	
609	UCAGAUCC U UAUGUGAA		UUCACAUA CUGAUGAG X CGAA IGAUCUGA	
620	UGUGAAGC U GAAACUUA		UAAGUUUC CUGAUGAG X CGAA ICUUCACA	
626	GCUGAAAC U UAUUCCUG		CAGGAAUA CUGAUGAG X CGAA IUUUCAGC	
632	ACUUAUUC C UGAUCCCA		UGGGAUCA CUGAUGAG X CGAA IAAUAAGU	
633	CUUAUUCC U GAUCCCAA		UUGGGAUC CUGAUGAG X CGAA IGAAUAAG	
638	UCCUGAUC C CAAGAAUG		CAUUCUUG CUGAUGAG X CGAA IAUCAGGA	
639	CCUGAUCC C AAGAAUGA		UCAUUCUU CUGAUGAG X CGAA IGAUCAGG	
640	CUGAUCCC A AGAAUGAA		UUCAUUCU CUGAUGAG X CGAA IGGAUCAG	
652	AUGAAAGC A AGCAAAAA		UUUUUGCU CUGAUGAG X CGAA ICUUUCAU	
656	AAGCAAGC A AAAAACCA		UGGUUUUU CUGAUGAG X CGAA ICUUGCUU	
663	CAAAAAAC C AAAACCAU		AUGGUUUU CUGAUGAG X CGAA IUUUUUUG	
664	AAAAAACC A AAACCAUC		GAUGGUUU CUGAUGAG X CGAA IGUUUUUU	
669	ACCAAAAC C AUCCGCUC		GAGCGGAU CUGAUGAG X CGAA IUUUUGGU	
670	CCAAAACC A UCCGCUCC		GGAGCGGA CUGAUGAG X CGAA IGUUUUGG	
673	AAACCAUC C GCUCCACA		UGUGGAGC CUGAUGAG X CGAA IAUGGUUU	
676	CCAUCCGC U CCACACUA		UAGUGUGG CUGAUGAG X CGAA ICGGAUGG	
678	AUCCGCUC C ACACUAAA		UUUAGUGU CUGAUGAG X CGAA IAGCGGAU	
679	UCCGCUCC A CACUAAAU		AUUUAGUG CUGAUGAG X CGAA IGAGCGGA	
681	CGCUCCAC A CUAAAUCC		GGAUUUAG CUGAUGAG X CGAA IUGGAGCG	
683	CUCCACAC U AAAUCCGC		GCGGAUUU CUGAUGAG X CGAA IUGUGGAG	

Table 63

689	ACUAAAUC C GCAGUGGA		UCCACUGC CUGAUGAG X CGAA IAUUUAGU	
692	AAAUCCGC A GUGGAAUG		CAUUCCAC CUGAUGAG X CGAA ICGGAUUU	
705	AAUGAGUC C UUUACAUU		AAUGUAAA CUGAUGAG X CGAA IACUCAUU	
706	AUGAGUCC U UUACAUUC		GAAUGUAA CUGAUGAG X CGAA IGACUCAU	
711	UCCUUUAC A UUCAAAUU		AAUUUGAA CUGAUGAG X CGAA IUAAAGGA	
715	UUACAUUC A AAUUGAAA		UUUCAAUU CUGAUGAG X CGAA IAAUGUAA	
725	AUUGAAAC C UUCAGACA		UGUCUGAA CUGAUGAG X CGAA IUUUCAAU	
726	UUGAAACC U UCAGACAA		UUGUCUGA CUGAUGAG X CGAA IGUUUCAA	
729	AAACCUUC A GACAAAGA		UCUUUGUC CUGAUGAG X CGAA IAAGGUUU	
733	CUUCAGAC A AAGACCGA		UCGGUCUU CUGAUGAG X CGAA IUCUGAAG	
739	ACAAAGAC C GACGACUG		CAGUCGUC CUGAUGAG X CGAA IUCUUUGU	
746	CCGACGAC U GUCUGUAG		CUACAGAC CUGAUGAG X CGAA IUCGUCGG	
750	CGACUGUC U GUAGAAAU		AUUUCUAC CUGAUGAG X CGAA IACAGUCG	
760	UAGAAAUC U GGGACUGG		CCAGUCCC CUGAUGAG X CGAA IAUUUCUA	
766	UCUGGGAC U GGGAUCGA		UCGAUCCC CUGAUGAG X CGAA IUCCCAGA	
777	GAUCGAAC A ACAAGGAA		UUCCUUGU CUGAUGAG X CGAA IUUCGAUC	
780	CGAACAAC A AGGAAUGA		UCAUUCCU CUGAUGAG X CGAA IUUGUUCG	
790	GGAAUGAC U UCAUGGGA		UCCCAUGA CUGAUGAG X CGAA IUCAUUCC	
793	AUGACUUC A UGGGAUCC		GGAUCCCA CUGAUGAG X CGAA IAAGUCAU	
801	AUGGGAUC C CUUUCCUU		AAGGAAAG CUGAUGAG X CGAA IAUCCCAU	
802	UGGGAUCC C UUUCCUUU		AAAGGAAA CUGAUGAG X CGAA IGAUCCCA	
803	GGGAUCCC U UUCCUUUG		CAAAGGAA CUGAUGAG X CGAA IGGAUCCC	
807	UCCCUUUC C UUUGGAGU		ACUCCAAA CUGAUGAG X CGAA IAAAGGGA	
808	CCCUUUCC U UUGGAGUU		AACUCCAA CUGAUGAG X CGAA IGAAAGGG	
824	UUCGGAGC U GAUGAAGA		UCUUCAUC CUGAUGAG X CGAA ICUCCGAA	
836	GAAGAUGC C GGCCAGUG		CACUGGCC CUGAUGAG X CGAA ICAUCUUC	
840	AUGCCGGC C AGUGGAUG		CAUCCACU CUGAUGAG X CGAA ICCGGCAU	
841	UGCCGGCC A GUGGAUGG		CCAUCCAC CUGAUGAG X CGAA IGCCGGCA	
853	GAUGGUAC A AGUUGCUU		AAGCAACU CUGAUGAG X CGAA IUACCAUC	
860	CAAGUUGC U UAACCAAG		CUUGGUUA CUGAUGAG X CGAA ICAACUUG	
865	UGCUUAAC C AAGAAGAA		UUCUUCUU CUGAUGAG X CGAA IUUAAGCA	
866	GCUUAACC A AGAAGAAG		CUUCUUCU CUGAUGAG X CGAA IGUUAAGC	
883	GUGAGUAC U ACAACGUA		UACGUUGU CUGAUGAG X CGAA IUACUCAC	
886	AGUACUAC A ACGUACCC		GGGUACGU CUGAUGAG X CGAA IUAGUACU	
893	CAACGUAC C CAUUCCGG		CCGGAAUG CUGAUGAG X CGAA IUACGUUG	
894	AACGUACC C AUUCCGGA		UCCGGAAU CUGAUGAG X CGAA IGUACGUU	
895	ACGUACCC A UUCCGGAA		UUCCGGAA CUGAUGAG X CGAA IGGUACGU	
899	ACCCAUUC C GGAAGGGG		CCCCUUCC CUGAUGAG X CGAA IAAUGGGU	
922	AAGGAAAC A UGGAACUC		GAGUUCCA CUGAUGAG X CGAA IUUUCCUU	
929	CAUGGAAC U CAGGCAGA		UCUGCCUG CUGAUGAG X CGAA IUUCCAUG	
931	UGGAACUC A GGCAGAAA		UUUCUGCC CUGAUGAG X CGAA IAGUUCCA	
935	ACUCAGGC A GAAAUUCG		CGAAUUUC CUGAUGAG X CGAA ICCUGAGU	
951	GAGAAAGC C AAACUUGG		CCAAGUUU CUGAUGAG X CGAA ICUUUCUC	
952	AGAAAGCC A AACUUGGC		GCCAAGUU CUGAUGAG X CGAA IGCUUUCU	
956	AGCCAAAC U UGGCCCUG		CAGGGCCA CUGAUGAG X CGAA IUUUGGCU	
961	AACUUGGC C CUGCUGGC		GCCAGCAG CUGAUGAG X CGAA ICCAAGUU	
962	ACUUGGCC C UGCUGGCA		UGCCAGCA CUGAUGAG X CGAA IGCCAAGU	
963	CUUGGCCC U GCUGGCAA		UUGCCAGC CUGAUGAG X CGAA IGGCCAAG	
966	GGCCCUGC U GGCAACAA		UUGUUGCC CUGAUGAG X CGAA ICAGGGCC	
970	CUGCUGGC A ACAAAGUC		GACUUUGU CUGAUGAG X CGAA ICCAGCAG	
973	CUGGCAAC A AAGUCAUC		GAUGACUU CUGAUGAG X CGAA IUUGCCAG	

Table 63

979	ACAAAGUC A UCAGUCCC		GGGACUGA CUGAUGAG X CGAA IACUUUGU	
982	AAGUCAUC A GUCCCUCU		AGAGGGAC CUGAUGAG X CGAA IAUGACUU	
986	CAUCAGUC C CUCUGAAG		CUUCAGAG CUGAUGAG X CGAA IACUGAUG	
987	AUCAGUCC C UCUGAAGA		UCUUCAGA CUGAUGAG X CGAA IGACUGAU	
988	UCAGUCCC U CUGAAGAC		GUCUUCAG CUGAUGAG X CGAA IGGACUGA	
990	AGUCCCUC U GAAGACAG		CUGUCUUC CUGAUGAG X CGAA IAGGGACU	
997	CUGAAGAC A GGAAACAA		UUGUUUCC CUGAUGAG X CGAA IUCUUCAG	
1004	CAGGAAAC A ACCUUCCA		UGGAAGGU CUGAUGAG X CGAA IUUUCCUG	
1007	GAAACAAC C UUCCAACA		UGUUGGAA CUGAUGAG X CGAA IUUGUUUC	
1008	AAACAACC U UCCAACAA		UUGUUGGA CUGAUGAG X CGAA IGUUGUUU	
1011	CAACCUUC C AACAACCU		AGGUUGUU CUGAUGAG X CGAA IAAGGUUG	
1012	AACCUUCC A ACAACCUU		AAGGUUGU CUGAUGAG X CGAA IGAAGGUU	
1015	CUUCCAAC A ACCUUGAC		GUCAAGGU CUGAUGAG X CGAA IUUGGAAG	
1018	CCAACAAC C UUGACCGA		UCGGUCAA CUGAUGAG X CGAA IUUGUUGG	
1019	CAACAACC U UGACCGAG		CUCGGUCA CUGAUGAG X CGAA IGUUGUUG	
1024	ACCUUGAC C GAGUGAAA		UUUCACUC CUGAUGAG X CGAA IUCAAGGU	
1034	AGUGAAAC U CACGGACU		AGUCCGUG CUGAUGAG X CGAA IUUUCACU	
1036	UGAAACUC A CGGACUUC		GAAGUCCG CUGAUGAG X CGAA IAGUUUCA	
1042	UCACGGAC U UCAAUUUC		GAAAUUGA CUGAUGAG X CGAA IUCCGUGA	
1045	CGGACUUC A AUUUCCUC		GAGGAAAU CUGAUGAG X CGAA IAAGUCCG	
1051	UCAAUUUC C UCAUGGUG		CACCAUGA CUGAUGAG X CGAA IAAAUUGA	
1052	CAAUUUCC U CAUGGUGU		ACACCAUG CUGAUGAG X CGAA IGAAAUUG	
1054	AUUUCCUC A UGGUGUUG		CAACACCA CUGAUGAG X CGAA IAGGAAAU	
1091	GGUGAUGC U UGCCGACA		UGUCGGCA CUGAUGAG X CGAA ICAUCACC	
1095	AUGCUUGC C GACAGGAA		UUCCUGUC CUGAUGAG X CGAA ICAAGCAU	
1099	UUGCCGAC A GGAAGGGC		GCCCUUCC CUGAUGAG X CGAA IUCGGCAA	
1108	GGAAGGGC A CAGAAGAA		UUCUUCUG CUGAUGAG X CGAA ICCCUUCC	
1110	AAGGGCAC A GAAGAACU		AGUUCUUC CUGAUGAG X CGAA IUGCCCUU	
1118	AGAAGAAC U GUAUGCAA		UUGCAUAC CUGAUGAG X CGAA IUUCUUCU	
1125	CUGUAUGC A AUCAAAAU		AUUUUGAU CUGAUGAG X CGAA ICAUACAG	
1129	AUGCAAUC A AAAUCCUG		CAGGAUUU CUGAUGAG X CGAA IAUUGCAU	
1135	UCAAAAUC C UGAAGAAG		CUUCUUCA CUGAUGAG X CGAA IAUUUUGA	
1136	CAAAAUCC U GAAGAAGG		CCUUCUUC CUGAUGAG X CGAA IGAUUUUG	
1157	GGUGAUUC A GGAUGAUG		CAUCAUCC CUGAUGAG X CGAA IAAUCACC	
1177	UGGAGUGC A CCAUGGUA		UACCAUGG CUGAUGAG X CGAA ICACUCCA	
1179	GAGUGCAC C AUGGUAGA		UCUACCAU CUGAUGAG X CGAA IUGCACUC	
1180	AGUGCACC A UGGUAGAA		UUCUACCA CUGAUGAG X CGAA IGUGCACU	
1198	AGCGAGUC U UGGCCCUG		CAGGGCCA CUGAUGAG X CGAA IACUCGCU	
1203	GUCUUGGC C CUGCUUGA		UCAAGCAG CUGAUGAG X CGAA ICCAAGAC	
1204	UCUUGGCC C UGCUUGAC		GUCAAGCA CUGAUGAG X CGAA IGCCAAGA	
1205	CUUGGCCC U GCUUGACA		UGUCAAGC CUGAUGAG X CGAA IGGCCAAG	
1208	GGCCCUGC U UGACAAAC		GUUUGUCA CUGAUGAG X CGAA ICAGGGCC	
1213	UGCUUGAC A AACCCCCG		CGGGGGUU CUGAUGAG X CGAA IUCAAGCA	
1217	UGACAAAC C CCCGUUCU		AGAACGGG CUGAUGAG X CGAA IUUUGUCA	
1218	GACAAACC C CCGUUCUU		AAGAACGG CUGAUGAG X CGAA IGUUUGUC	
1219	ACAAACCC C CGUUCUUG		CAAGAACG CUGAUGAG X CGAA IGGUUUGU	
1220	CAAACCCC C GUUCUUGA		UCAAGAAC CUGAUGAG X CGAA IGGGUUUG	
1225	CCCCGUUC U UGACGCAG		CUGCGUCA CUGAUGAG X CGAA IAACGGGG	
1232	CUUGACGC A GCUGCACU		AGUGCAGC CUGAUGAG X CGAA ICGUCAAG	
1235	GACGCAGC U GCACUCCU		AGGAGUGC CUGAUGAG X CGAA ICUGCGUC	
1238	GCAGCUGC A CUCCUGCU		AGCAGGAG CUGAUGAG X CGAA ICAGCUGC	

Table 63

1240	AGCUGCAC U CCUGCUUC		GAAGCAGG CUGAUGAG X CGAA IUGCAGCU	
1242	CUGCACUC C UGCUUCCA		UGGAAGCA CUGAUGAG X CGAA IAGUGCAG	
1243	UGCACUCC U GCUUCCAG		CUGGAAGC CUGAUGAG X CGAA IGAGUGCA	
1246	ACUCCUGC U UCCAGACA		UGUCUGGA CUGAUGAG X CGAA ICAGGAGU	
1249	CCUGCUUC C AGACAGUG		CACUGUCU CUGAUGAG X CGAA IAAGCAGG	
1250	CUGCUUCC A GACAGUGG		CCACUGUC CUGAUGAG X CGAA IGAAGCAG	
1254	UUCCAGAC A GUGGAUCG		CGAUCCAC CUGAUGAG X CGAA IUCUGGAA	
1265	GGAUCGGC U GUACUUCG		CGAAGUAC CUGAUGAG X CGAA ICCGAUCC	
1270	GGCUGUAC U UCGUCAUG		CAUGACGA CUGAUGAG X CGAA IUACAGCC	
1276	ACUUCGUC A UGGAAUAU		AUAUUCCA CUGAUGAG X CGAA IACGAAGU	
1288	AAUAUGUC A ACGGUGGG		CCCACCGU CUGAUGAG X CGAA IACAUAUU	
1300	GUGGGGAC C UCAUGUAC		GUACAUGA CUGAUGAG X CGAA IUCCCCAC	
1301	UGGGGACC U CAUGUACC		GGUACAUG CUGAUGAG X CGAA IGUCCCCA	
1303	GGGACCUC A UGUACCAC		GUGGUACA CUGAUGAG X CGAA IAGGUCCC	
1309	UCAUGUAC C ACAUUCAG		CUGAAUGU CUGAUGAG X CGAA IUACAUGA	
1310	CAUGUACC A CAUUCAGC		GCUGAAUG CUGAUGAG X CGAA IGUACAUG	
1312	UGUACCAC A UUCAGCAA		UUGCUGAA CUGAUGAG X CGAA IUGGUACA	
1316	CCACAUUC A GCAAGUAG		CUACUUGC CUGAUGAG X CGAA IAAUGUGG	
1319	CAUUCAGC A AGUAGGAA		UUCCUACU CUGAUGAG X CGAA ICUGAAUG	
1340	UAAGGAAC C ACAAGCAG		CUGCUUGU CUGAUGAG X CGAA IUUCCUUA	
1341	AAGGAACC A CAAGCAGU		ACUGCUUG CUGAUGAG X CGAA IGUUCCUU	
1343	GGAACCAC A AGCAGUAU		AUACUGCU CUGAUGAG X CGAA IUGGUUCC	
1347	CCACAAGC A GUAUUCUA		UAGAAUAC CUGAUGAG X CGAA ICUUGUGG	
1354	CAGUAUUC U AUGCGGCA		UGCCGCAU CUGAUGAG X CGAA IAAUACUG	
1362	UAUGCGGC A GAGAUUUC		GAAAUCUC CUGAUGAG X CGAA ICCGCAUA	
1371	GAGAUUUC C AUCGGAUU		AAUCCGAU CUGAUGAG X CGAA IAAAUCUC	
1372	AGAUUUCC A UCGGAUUG		CAAUCCGA CUGAUGAG X CGAA IGAAAUCU	
1384	GAUUGUUC U UUCUUCAU		AUGAAGAA CUGAUGAG X CGAA IAACAAUC	
1388	GUUCUUUC U UCAUAAAA		UUUUAUGA CUGAUGAG X CGAA IAAAGAAC	
1391	CUUUCUUC A UAAAAGAG		CUCUUUUA CUGAUGAG X CGAA IAAGAAAG	
1405	GAGGAAUC A UUUAUAGG		CCUAUAAA CUGAUGAG X CGAA IAUUCCUC	
1418	UAGGGAUC U GAAGUUAG		CUAACUUC CUGAUGAG X CGAA IAUCCCUA	
1435	AUAACGUC A UGUUGGAU		AUCCAACA CUGAUGAG X CGAA IACGUUAU	
1446	UUGGAUUC A GAAGGACA		UGUCCUUC CUGAUGAG X CGAA IAAUCCAA	
1454	AGAAGGAC A UAUCAAAA		UUUUGAUA CUGAUGAG X CGAA IUCCUUCU	
1459	GACAUAUC A AAAUUGCU		AGCAAUUU CUGAUGAG X CGAA IAUAUGUC	
1467	AAAAUUGC U GACUUUGG		CCAAAGUC CUGAUGAG X CGAA ICAAUUUU	
1471	UUGCUGAC U UUGGGAUG		CAUCCCAA CUGAUGAG X CGAA IUCAGCAA	
1483	GGAUGUGC A AGGAACAC		GUGUUCCU CUGAUGAG X CGAA ICACAUCC	
1490	CAAGGAAC A CAUGAUGG		CCAUCAUG CUGAUGAG X CGAA IUUCCUUG	
1492	AGGAACAC A UGAUGGAU		AUCCAUCA CUGAUGAG X CGAA IUGUUCCU	
1507	AUGGAGUC A CGACCAGG		CCUGGUCG CUGAUGAG X CGAA IACUCCAU	
1512	GUCACGAC C AGGACCUU		AAGGUCCU CUGAUGAG X CGAA IUCGUGAC	
1513	UCACGACC A GGACCUUC		GAAGGUCC CUGAUGAG X CGAA IGUCGUGA	
1518	ACCAGGAC C UUCUGUGG		CCACAGAA CUGAUGAG X CGAA IUCCUGGU	
1519	CCAGGACC U UCUGUGGG		CCCACAGA CUGAUGAG X CGAA IGUCCUGG	
1522	GGACCUUC U GUGGGACU		AGUCCCAC CUGAUGAG X CGAA IAAGGUCC	
1530	UGUGGGAC U CCAGAUUA		UAAUCUGG CUGAUGAG X CGAA IUCCCACA	
1532	UGGGACUC C AGAUUAUA		UAUAAUCU CUGAUGAG X CGAA IAGUCCCA	
1533	GGGACUCC A GAUUAUAU		AUAUAAUC CUGAUGAG X CGAA IGAGUCCC	
1545	UAUAUCGC C CCAGAGAU		AUCUCUGG CUGAUGAG X CGAA ICGAUAUA	

Table 63

1546	AUAUCGCC C CAGAGAUA		UAUCUCUG CUGAUGAG X CGAA IGCGAUAU	
1547	UAUCGCCC C AGAGAUAA		UUAUCUCU CUGAUGAG X CGAA IGGCGAUA	
1548	AUCGCCCC A GAGAUAAU		AUUAUCUC CUGAUGAG X CGAA IGGGCGAU	
1560	AUAAUCGC U UAUCAGCC		GGCUGAUA CUGAUGAG X CGAA ICGAUUAU	
1565	CGCUUAUC A GCCGUAUG		CAUACGGC CUGAUGAG X CGAA IAUAAGCG	
1568	UUAUCAGC C GUAUGGAA		UUCCAUAC CUGAUGAG X CGAA ICUGAUAA	
1581	GGAAAAUC U GUGGACUG		CAGUCCAC CUGAUGAG X CGAA IAUUUUCC	
1588	CUGUGGAC U GGUGGGCC		GGCCCACC CUGAUGAG X CGAA IUCCACAG	
1596	UGGUGGGC C UAUGGCGU		ACGCCAUA CUGAUGAG X CGAA ICCCACCA	
1597	GGUGGGCC U AUGGCGUC		GACGCCAU CUGAUGAG X CGAA IGCCCACC	
1606	AUGGCGUC C UGUUGUAU		AUACAACA CUGAUGAG X CGAA IACGCCAU	
1607	UGGCGUCC U GUUGUAUG		CAUACAAC CUGAUGAG X CGAA IGACGCCA	
1622	UGAAAUGC U UGCCGGGC		GCCCGGCA CUGAUGAG X CGAA ICAUUUCA	
1626	AUGCUUGC C GGGCAGCC		GGCUGCCC CUGAUGAG X CGAA ICAAGCAU	
1631	UGCCGGGC A GCCUCCAU		AUGGAGGC CUGAUGAG X CGAA ICCCGGCA	
1634	CGGGCAGC C UCCAUUUG		CAAAUGGA CUGAUGAG X CGAA ICUGCCCG	
1635	GGGCAGCC U CCAUUUGA		UCAAAUGG CUGAUGAG X CGAA IGCUGCCC	
1637	GCAGCCUC C AUUUGAUG		CAUCAAAU CUGAUGAG X CGAA IAGGCUGC	
1638	CAGCCUCC A UUUGAUGG		CCAUCAAA CUGAUGAG X CGAA IGAGGCUG	
1664	AGACGAGC U AUUUCAGU		ACUGAAAU CUGAUGAG X CGAA ICUCGUCU	
1670	GCUAUUUC A GUCUAUCA		UGAUAGAC CUGAUGAG X CGAA IAAAUAGC	
1674	UUUCAGUC U AUCAUGGA		UCCAUGAU CUGAUGAG X CGAA IACUGAAA	
1678	AGUCUAUC A UGGAGCAC		GUGCUCCA CUGAUGAG X CGAA IAUAGACU	
1685	CAUGGAGC A CAACGUUU		AAACGUUG CUGAUGAG X CGAA ICUCCAUG	
1687	UGGAGCAC A ACGUUUCC		GGAAACGU CUGAUGAG X CGAA IUGCUCCA	
1695	AACGUUUC C UAUCCAAA		UUUGGAUA CUGAUGAG X CGAA IAAACGUU	
1696	ACGUUUCC U AUCCAAAA		UUUUGGAU CUGAUGAG X CGAA IGAAACGU	
1700	UUCCUAUC C AAAAUCCU		AGGAUUUU CUGAUGAG X CGAA IAUAGGAA	
1701	UCCUAUCC A AAAUCCUU		AAGGAUUU CUGAUGAG X CGAA IGAUAGGA	
1707	CCAAAAUC C UUGUCCAA		UUGGACAA CUGAUGAG X CGAA IAUUUUGG	
1708	CAAAAUCC U UGUCCAAG		CUUGGACA CUGAUGAG X CGAA IGAUUUUG	
1713	UCCUUGUC C AAGGAGGC		GCCUCCUU CUGAUGAG X CGAA IACAAGGA	
1714	CCUUGUCC A AGGAGGCU		AGCCUCCU CUGAUGAG X CGAA IGACAAGG	
1722	AAGGAGGC U GUUUCUAU		AUAGAAAC CUGAUGAG X CGAA ICCUCCUU	
1728	GCUGUUUC U AUCUGCAA		UUGCAGAU CUGAUGAG X CGAA IAAACAGC	
1732	UUUCUAUC U GCAAAGGA		UCCUUUGC CUGAUGAG X CGAA IAUAGAAA	
1735	CUAUCUGC A AAGGACUG		CAGUCCUU CUGAUGAG X CGAA ICAGAUAG	
1742	CAAAGGAC U GAUGACCA		UGGUCAUC CUGAUGAG X CGAA IUCCUUUG	
1749	CUGAUGAC C AAACACCC		GGGUGUUU CUGAUGAG X CGAA IUCAUCAG	
1750	UGAUGACC A AACACCCA		UGGGUGUU CUGAUGAG X CGAA IGUCAUCA	
1754	GACCAAAC A CCCAGCCA		UGGCUGGG CUGAUGAG X CGAA IUUUGGUC	
1756	CCAAACAC C CAGCCAAG		CUUGGCUG CUGAUGAG X CGAA IUGUUUGG	
1757	CAAACACC C AGCCAAGC		GCUUGGCU CUGAUGAG X CGAA IGUGUUUG	
1758	AAACACCC A GCCAAGCG		CGCUUGGC CUGAUGAG X CGAA IGGUGUUU	
1761	CACCCAGC C AAGCGGCU		AGCCGCUU CUGAUGAG X CGAA ICUGGGUG	
1762	ACCCAGCC A AGCGGCUG		CAGCCGCU CUGAUGAG X CGAA IGCUGGGU	
1769	CAAGCGGC U GGGCUGUG		CACAGCCC CUGAUGAG X CGAA ICCGCUUG	
1774	GGCUGGGC U GUGGGCCU		AGGCCCAC CUGAUGAG X CGAA ICCCAGCC	
1781	CUGUGGGC C UGAGGGGG		CCCCCUCA CUGAUGAG X CGAA ICCCACAG	
1782	UGUGGGCC U GAGGGGGA		UCCCCCUC CUGAUGAG X CGAA IGCCCACA	
1808	GAGAGAGC A UGCCUUCU		AGAAGGCA CUGAUGAG X CGAA ICUCUCUC	

Table 63

1812	GAGCAUGC C UUCUUCCG		CGGAAGAA CUGAUGAG X CGAA ICAUGCUC	
1813	AGCAUGCC U UCUUCCGG		CCGGAAGA CUGAUGAG X CGAA IGCAUGCU	
1816	AUGCCUUC U UCCGGAGG		CCUCCGGA CUGAUGAG X CGAA IAAGGCAU	
1819	CCUUCUUC C GGAGGAUC		GAUCCUCC CUGAUGAG X CGAA IAAGAAGG	
1831	GGAUCGAC U GGGAAAAA		UUUUUCCC CUGAUGAG X CGAA IUCGAUCC	
1841	GGAAAAAC U GGAGAACA		UGUUCUCC CUGAUGAG X CGAA IUUUUUCC	
1849	UGGAGAAC A GGGAGAUC		GAUCUCCC CUGAUGAG X CGAA IUUCUCCA	
1858	GGGAGAUC C AGCCACCA		UGGUGGCU CUGAUGAG X CGAA IAUCUCCC	
1859	GGAGAUCC A GCCACCAU		AUGGUGGC CUGAUGAG X CGAA IGAUCUCC	
1862	GAUCCAGC C ACCAUUCA		UGAAUGGU CUGAUGAG X CGAA ICUGGAUC	
1863	AUCCAGCC A CCAUUCAA		UUGAAUGG CUGAUGAG X CGAA IGCUGGAU	
1865	CCAGCCAC C AUUCAAGC		GCUUGAAU CUGAUGAG X CGAA IUGGCUGG	
1866	CAGCCACC A UUCAAGCC		GGCUUGAA CUGAUGAG X CGAA IGUGGCUG	
1870	CACCAUUC A AGCCCAAA		UUUGGGCU CUGAUGAG X CGAA IAAUGGUG	
1874	AUUCAAGC C CAAAGUGU		ACACUUUG CUGAUGAG X CGAA ICUUGAAU	
1875	UUCAAGCC C AAAGUGUG		CACACUUU CUGAUGAG X CGAA IGCUUGAA	
1876	UCAAGCCC A AAGUGUGU		ACACACUU CUGAUGAG X CGAA IGGCUUGA	
1888	UGUGUGGC A AAGGAGCA		UGCUCCUU CUGAUGAG X CGAA ICCACACA	
1896	AAAGGAGC A GAGAACUU		AAGUUCUC CUGAUGAG X CGAA ICUCCUUU	
1903	CAGAGAAC U UUGACAAG		CUUGUCAA CUGAUGAG X CGAA IUUCUCUG	
1909	ACUUUGAC A AGUUCUUC		GAAGAACU CUGAUGAG X CGAA IUCAAAGU	
1915	ACAAGUUC U UCACACGA		UCGUGUGA CUGAUGAG X CGAA IAACUUGU	
1918	AGUUCUUC A CACGAGGA		UCCUCGUG CUGAUGAG X CGAA IAAGAACU	
1920	UUCUUCAC A CGAGGACA		UGUCCUCG CUGAUGAG X CGAA IUGAAGAA	
1928	ACGAGGAC A GCCCGUCU		AGACGGGC CUGAUGAG X CGAA IUCCUCGU	
1931	AGGACAGC C CGUCUUAA		UUAAGACG CUGAUGAG X CGAA ICUGUCCU	
1932	GGACAGCC C GUCUUAAC		GUUAAGAC CUGAUGAG X CGAA IGCUGUCC	
1936	AGCCCGUC U UAACACCA		UGGUGUUA CUGAUGAG X CGAA IACGGGCU	
1941	GUCUUAAC A CCACCUGA		UCAGGUGG CUGAUGAG X CGAA IUUAAGAC	
1943	CUUAACAC C ACCUGAUC		GAUCAGGU CUGAUGAG X CGAA IUGUUAAG	
1944	UUAACACC A CCUGAUCA		UGAUCAGG CUGAUGAG X CGAA IGUGUUAA	
1946	AACACCAC C UGAUCAGC		GCUGAUCA CUGAUGAG X CGAA IUGGUGUU	
1947	ACACCACC U GAUCAGCU		AGCUGAUC CUGAUGAG X CGAA IGUGGUGU	
1952	ACCUGAUC A GCUGGUUA		UAACCAGC CUGAUGAG X CGAA IAUCAGGU	
1955	UGAUCAGC U GGUUAUUG		CAAUAACC CUGAUGAG X CGAA ICUGAUCA	
1965	GUUAUUGC U AACAUAGA		UCUAUGUU CUGAUGAG X CGAA ICAAUAAC	
1969	UUGCUAAC A UAGACCAG		CUGGUCUA CUGAUGAG X CGAA IUUAGCAA	
1975	ACAUAGAC C AGUCUGAU		AUCAGACU CUGAUGAG X CGAA IUCUAUGU	
1976	CAUAGACC A GUCUGAUU		AAUCAGAC CUGAUGAG X CGAA IGUCUAUG	
1980	GACCAGUC U GAUUUUGA		UCAAAAUC CUGAUGAG X CGAA IACUGGUC	
1996	AAGGGUUC U CGUAUGUC		GACAUACG CUGAUGAG X CGAA IAACCCUU	
2005	CGUAUGUC A ACCCCCAG		CUGGGGGU CUGAUGAG X CGAA IACAUACG	
2008	AUGUCAAC C CCCAGUUU		AAACUGGG CUGAUGAG X CGAA IUUGACAU	
2009	UGUCAACC C CCAGUUUG		CAAACUGG CUGAUGAG X CGAA IGUUGACA	
2010	GUCAACCC C CAGUUUGU		ACAAACUG CUGAUGAG X CGAA IGGUUGAC	
2011	UCAACCCC C AGUUUGUG		CACAAACU CUGAUGAG X CGAA IGGGUUGA	
2012	CAACCCCC A GUUUGUGC		GCACAAAC CUGAUGAG X CGAA IGGGGUUG	
2021	GUUUGUGC A CCCCAUCU		AGAUGGGG CUGAUGAG X CGAA ICACAAAC	
2023	UUGUGCAC C CCAUCUUA		UAAGAUGG CUGAUGAG X CGAA IUGCACAA	
2024	UGUGCACC C CAUCUUAC		GUAAGAUG CUGAUGAG X CGAA IGUGCACA	
2025	GUGCACCC C AUCUUACA		UGUAAGAU CUGAUGAG X CGAA IGGUGCAC	

Table 63

2026	UGCACCCC A UCUUACAG		CUGUAAGA CUGAUGAG X CGAA IGGGUGCA	
2029	ACCCCAUC U UACAGAGU		ACUCUGUA CUGAUGAG X CGAA IAUGGGGU	
2033	CAUCUUAC A GAGUGCAG		CUGCACUC CUGAUGAG X CGAA IUAAGAUG	
2040	CAGAGUGC A GUAUGAAA		UUUCAUAC CUGAUGAG X CGAA ICACUCUG	
2050	UAUGAAAC U CACCAGCG		CGCUGGUG CUGAUGAG X CGAA IUUUCAUA	
2052	UGAAACUC A CCAGCGAG		CUCGCUGG CUGAUGAG X CGAA IAGUUUCA	
2054	AAACUCAC C AGCGAGAA		UUCUCGCU CUGAUGAG X CGAA IUGAGUUU	
2055	AACUCACC A GCGAGAAC		GUUCUCGC CUGAUGAG X CGAA IGUGAGUU	
2064	GCGAGAAC A AACACCUC		GAGGUGUU CUGAUGAG X CGAA IUUCUCGC	
2068	GAACAAAC A CCUCCCCA		UGGGGAGG CUGAUGAG X CGAA IUUUGUUC	
2070	ACAAACAC C UCCCCAGC		GCUGGGGA CUGAUGAG X CGAA IUGUUUGU	
2071	CAAACACC U CCCCAGCC		GGCUGGGG CUGAUGAG X CGAA IGUGUUUG	
2073	AACACCUC C CCAGCCCC		GGGGCUGG CUGAUGAG X CGAA IAGGUGUU	
2074	ACACCUCC C CAGCCCCC		GGGGGCUG CUGAUGAG X CGAA IGAGGUGU	
2075	CACCUCCC C AGCCCCCA		UGGGGGCU CUGAUGAG X CGAA IGGAGGUG	
2076	ACCUCCCC A GCCCCCAG		CUGGGGGC CUGAUGAG X CGAA IGGGAGGU	
2079	UCCCCAGC C CCCAGCCC		GGGCUGGG CUGAUGAG X CGAA ICUGGGGA	
2080	CCCCAGCC C CCAGCCCU		AGGGCUGG CUGAUGAG X CGAA IGCUGGGG	
2081	CCCAGCCC C CAGCCCUC		GAGGGCUG CUGAUGAG X CGAA IGGCUGGG	
2082	CCAGCCCC C AGCCCUCC		GGAGGGCU CUGAUGAG X CGAA IGGGCUGG	
2083	CAGCCCCC A GCCCUCCC		GGGAGGGC CUGAUGAG X CGAA IGGGGCUG	
2086	CCCCCAGC C CUCCCCGC		GCGGGGAG CUGAUGAG X CGAA ICUGGGGG	
2087	CCCCAGCC C UCCCCGCA		UGCGGGGA CUGAUGAG X CGAA IGCUGGGG	
2088	CCCAGCCC U CCCCGCAG		CUGCGGGG CUGAUGAG X CGAA IGGCUGGG	
2090	CAGCCCUC C CCGCAGUG		CACUGCGG CUGAUGAG X CGAA IAGGGCUG	
2091	AGCCCUCC C CGCAGUGG		CCACUGCG CUGAUGAG X CGAA IGAGGGCU	
2092	GCCCUCCC C GCAGUGGA		UCCACUGC CUGAUGAG X CGAA IGGAGGGC	
2095	CUCCCCGC A GUGGAAGU		ACUUCCAC CUGAUGAG X CGAA ICGGGGAG	
2109	AGUGAAUC C UUAACCCU		AGGGUUAA CUGAUGAG X CGAA IAUUCACU	
2110	GUGAAUCC U UAACCCUA		UAGGGUUA CUGAUGAG X CGAA IGAUUCAC	
2115	UCCUUAAC C CUAAAAUU		AAUUUUAG CUGAUGAG X CGAA IUUAAGGA	
2116	CCUUAACC C UAAAAUUU		AAAUUUUA CUGAUGAG X CGAA IGUUAAGG	
2117	CUUAACCC U AAAAUUUU		AAAAUUUU CUGAUGAG X CGAA IGGUUAAG	
2131	UUUAAGGC C ACGGCUUG		CAAGCCGU CUGAUGAG X CGAA ICCUUAAA	
2132	UUAAGGCC A CGGCUUGU		ACAAGCCG CUGAUGAG X CGAA IGCCUUAA	
2137	GCCACGGC U UGUGUCUG		CAGACACA CUGAUGAG X CGAA ICCGUGGC	
2144	CUUGUGUC U GAUUCCAU		AUGGAAUC CUGAUGAG X CGAA IACACAAG	
2150	UCUGAUUC C AUAUGGAG		CUCCAUAU CUGAUGAG X CGAA IAAUCAGA	
2151	CUGAUUCC A UAUGGAGG		CCUCCAUA CUGAUGAG X CGAA IGAAUCAG	
2161	AUGGAGGC C UGAAAAUU		AAUUUUCA CUGAUGAG X CGAA ICCUCCAU	
2162	UGGAGGCC U GAAAAUUG		CAAUUUUC CUGAUGAG X CGAA IGCCUCCA	
2185	UAUUAGUC C AAAUGUGA		UCACAUUU CUGAUGAG X CGAA IACUAAUA	
2186	AUUAGUCC A AAUGUGAU		AUCACAUU CUGAUGAG X CGAA IGACUAAU	
2196	AUGUGAUC A ACUGUUCA		UGAACAGU CUGAUGAG X CGAA IAUCACAU	
2199	UGAUCAAC U GUUCAGGG		CCCUGAAC CUGAUGAG X CGAA IUUGAUCA	
2204	AACUGUUC A GGGUCUCU		AGAGACCC CUGAUGAG X CGAA IAACAGUU	
2210	UCAGGGUC U CUCUCUUA		UAAGAGAG CUGAUGAG X CGAA IACCCUGA	
2212	AGGGUCUC U CUCUUACA		UGUAAGAG CUGAUGAG X CGAA IAGACCCU	
2214	GGUCUCUC U CUUACAAC		GUUGUAAG CUGAUGAG X CGAA IAGAGACC	
2216	UCUCUCUC U UACAACCA		UGGUUGUA CUGAUGAG X CGAA IAGAGAGA	
2220	UCUCUUAC A ACCAAGAA		UUCUUGGU CUGAUGAG X CGAA IUAAGAGA	

Table 63

2223	CUUACAAC C AAGAACAU		AUGUUCUU CUGAUGAG X CGAA IUUGUAAG	
2224	UUACAACC A AGAACAUU		AAUGUUCU CUGAUGAG X CGAA IGUUGUAA	
2230	CCAAGAAC A UUAUCUUA		UAAGAUAA CUGAUGAG X CGAA IUUCUUGG	
2236	ACAUUAUC U UAGUGGAA		UUCCACUA CUGAUGAG X CGAA IAUAAUGU	

Input Sequence = PRKCA. Cut Site = CH/.
Stem Length = 8 . Core Sequence = CUGAUGAG X CGAA (X = GCCGUUAGGC or other stem II)
PRKCA (Homo sapiens protein kinase C, alpha (PRKCA) mRNA.; 2245 bp)

Table 64

Table 64: Activity of ribozyme core substituted analogues

A

RYH/	**All ribo I-15.1 K_{obs} (min^{-1})**	**G-5, A-6, G-8, G-12, I-15.1 ribo 2'-O-allyl environment K_{obs} (min^{-1})**		
		U-4=ribo U	U-4=2'-amino U	U-4=2'-O-alkyl U
GCA	0.39	0.10	0.08	0.02
GCC	0.19	0.03	0.01	0.003
GCU	0.028	0.025	0.013	0.002

B

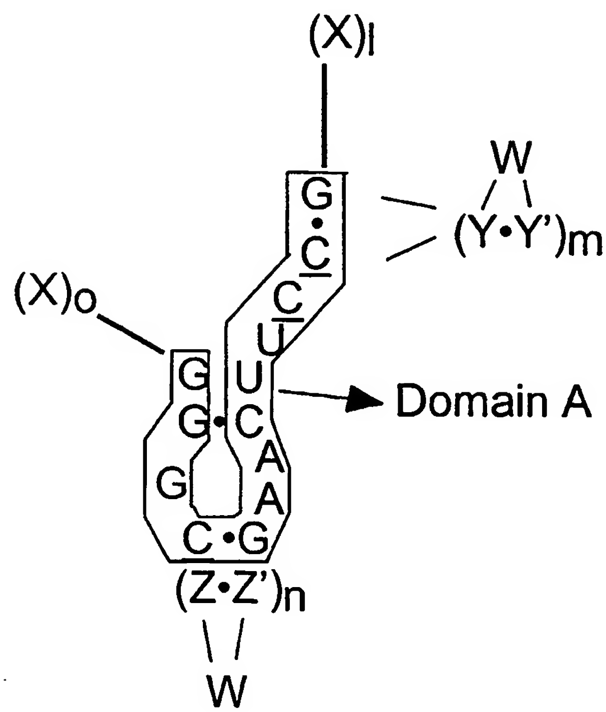
RYH/	**All ribo A-15.1 K_{obs} (min^{-1})**	**G-5, A-6, G-8, G-12, A-15.1 ribo 2'-O-allyl environment K_{obs} (min^{-1})**		
		U-4=ribo U	U-4=2'-amino U	U-4=2'-O-alkyl U
GUA	0.12	0.06	0.04	0.01
GUC	0.15	0.015	0.014	0.001
GUU	0.04	0.031	0.012	0.008

Comparison of single turnover cleavage rates for GCH and GUH substrates with I-15.1 and A-15.1 ribozymes and ribozyme analogs. Conditions: Single turnover (250 nM substrate, 2.5 μM ribozyme) pH 6.0, 37 C, 10 mM Mg^{++}

Claims:

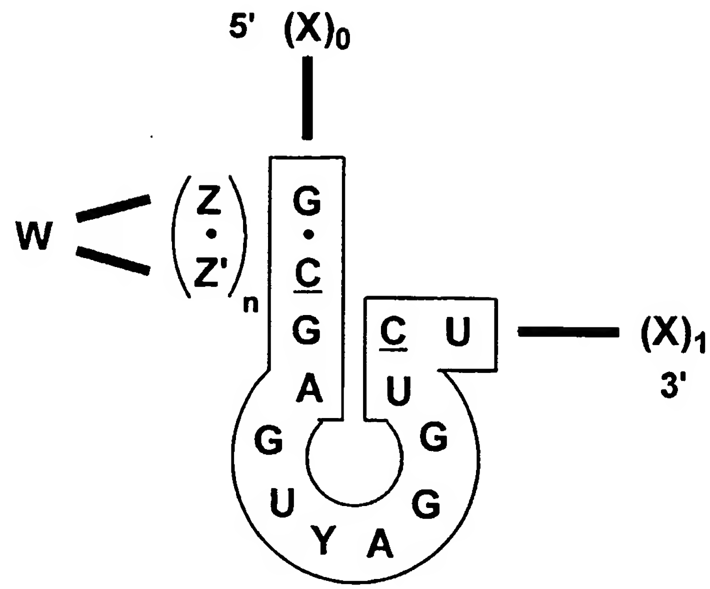
We claim:

1. An enzymatic nucleic acid molecule having formula 4 namely:



wherein each X, Y, and Z represents independently a nucleotide which may be the same or different; l is an integer greater than or equal to 3; m is an integer greater than 1 ; n is an integer greater than 1; 0 is an integer greater than or equal to 3; Z' is a nucleotide complementary to Z; Y' is a nucleotide complementary to Y; each X(l) and X(o) are oligonucleotides which are of sufficient length to stably interact independently with a target nucleic acid sequence; W is a linker of ≥ 2 nucleotides; A, U, G, and C represent nucleotides; C is 2'-amino; and ___ represents a chemical linkage.

2. An enzymatic nucleic acid molecule having formula 5 namely:



wherein each X, Y, and Z represents independently a nucleotide which may be the same or different; l is an integer greater than or equal to 3; n is an integer greater than 1; 0 is an integer greater than or equal to 3; Z' is a nucleotide complementary to Z; each $X_{(l)}$ and $X_{(o)}$ are oligonucleotides which are of sufficient length to stably interact independently with a target nucleic acid sequence; W is a linker of ≥ 2 nucleotides in length or may be a non-nucleotide linker; A, U, G, and C represent nucleotides; C is 2'-amino; and ___ represents a chemical linkage.

3. The enzymatic nucleic acid molecule of claims 1 or 2, wherein l is selected from the group consisting of 4, 5, 6, 7, 8, 9, 10, 11, 12, and 15.

4. The enzymatic nucleic acid molecule of claim 1, wherein m is selected from the group consisting of 2, 3, 4, 5, 6, and 7.

5. The enzymatic nucleic acid molecule of claims 1 or 2, wherein n is selected from the group consisting of 2, 3, 4, 5, 6, and 7.

6. The enzymatic nucleic acid molecule of claims 1 or 2, wherein o is selected from the group consisting of 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 15.

7. The enzymatic nucleic acid molecule of claims 1 or 2, wherein l and o are of the same length.

8. The enzymatic nucleic acid molecule of claims 1 or 2, wherein l and o are of different length.

9. The enzymatic nucleic acid molecule of claims 1 or 2, wherein the target nucleic acid sequence is selected from the group consisting of an RNA, DNA and RNA/DNA mixed polymer.

10. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said chemical linkage is selected from the group consisting of phosphate ester linkage, amide linkage, phosphorothioate, and phosphorodithioate.

11. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said C is selected from the group consisting of 2'-deoxy-2'-NH_2 and 2'-deoxy-2'-O-NH_2.

12. A method for inhibiting expression of a gene in a cell, comprising the step of administering to said cell the enzymatic nucleic acid molecule of claims 1 or 2 under conditions suitable for said inhibition.

13. A method of cleaving a separate RNA molecule comprising, contacting the enzymatic nucleic acid molecule of claims 1 or 2 with said separate RNA molecule under conditions suitable for the cleavage of said separate RNA molecule.

14. The method of claim 13, wherein said cleavage is carried out in the presence of a divalent cation.

15. The method of claim 14, wherein said divalent cation is Mg^{2+}.

16. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said enzymatic nucleic acid molecule is chemically synthesized.

17. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said enzymatic nucleic acid molecule comprises at least one ribonucleotide.

18. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said enzymatic nucleic acid molecule comprises no ribonucleotide residues.

19. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said enzymatic nucleic acid molecule comprises at least one 2-amino modification.

20. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said enzymatic nucleic acid molecule comprises at least three phosphorothioate modifications.

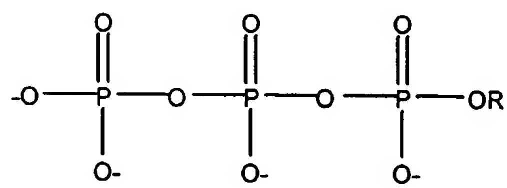
21. The enzymatic nucleic acid molecule of claim 20, wherein said phosphorothioate modification is at the 5'-end of said enzymatic nucleic acid molecule.

22. The enzymatic nucleic acid molecule of claims 1 or 2, wherein said enzymatic nucleic acid molecule comprises a 5'-cap or a 3'-cap or both a 5'-cap and a 3'-cap.

23. The enzymatic nucleic acid molecule of claim 22, wherein said 5-cap is phosphorothioate modification.

24. The enzymatic nucleic acid molecule of claim 22, wherein said 3'-cap is an inverted abasic moiety.

25. A compound having the formula 3:



wherein R is independently any nucleoside selected from the group consisting of 2'-*O*-methyl-2,6-diaminopurine riboside; 2'-deoxy-2'amino-2,6-diaminopurine riboside; 2'-(*N*-alanyl) amino-2'-deoxy-uridine; 2'-(*N*-phenylalanyl)amino-2'-deoxy-uridine; 2'-deoxy -2'-(*N*-β-alanyl) amino ; 2'-deoxy-2'-(lysiyl) amino uridine; 2'-*C*-allyl uridine; 2'-*O*-amino-uridine; 2'-*O*-methylthiomethyl adenosine; 2'-*O*-methylthiomethyl cytidine ; 2'-*O*-methylthiomethyl guanosine; 2'-*O*-methylthiomethyl-uridine; 2'-deoxy-2'-(*N*-histidyl) amino uridine; 2'-deoxy-2'-amino-5-methyl cytidine; 2'-(*N*-β-carboxamidine-β-alanyl)amino-2'-deoxy-uridine; 2'-deoxy-2'-(N-β-alanyl)-guanosine; 2'-*O*-amino-adenosine; 2'-(*N*-lysyl)amino-2'-deoxy-cytidine; 2'-Deoxy -2'-(L-histidine) amino Cytidine; 5-Imidazoleacetic acid 2'-deoxy uridine, 5-[3-(N-4-imidazoleacetyl)aminopropynyl]-2'-O-methyl uridine, 5-(3-aminopropynyl)-2'-O-methyl uridine, 5-(3-aminopropyl)-2'-O-methyl uridine, 5-[3-(N-4-imidazoleacetyl)aminopropyl]-2'-O-methyl uridine, 5-(3-aminopropyl)-2'-deoxy-2-fluoro uridine, 2'-Deoxy-2'-(β-alanyl-L-histidyl)amino uridine, 2'-deoxy-2'-β-alaninamido-uridine, 3-(2'-deoxy-2'-fluoro-β-D-ribofuranosyl)piperazino[2,3-D]pyrimidine-2-one, 5-[3-(N-4-imidazoleacetyl)aminopropyl]-2'-deoxy-2'-fluoro uridine, 5-[3-(N-4-imidazoleacetyl)aminopropynyl]-2'-deoxy-2'-fluoro uridine, 5-E-

(2-carboxyvinyl-2'-deoxy-2'-fluoro uridine, 5-[3-(N-4-aspartyl)aminopropynyl-2'-fluoro uridine, 5-(3-aminopropyl)-2'-deoxy-2-fluoro cytidine, and 5-[3-(N-4-succynyl)aminopropyl-2'-deoxy-2-fluoro cytidine.

26. A process for incorporation of the compounds of claim 25 into an oligonucleotide comprising the step of contacting said compound with a mixture comprising a nucleic acid template, an RNA polymerase enzyme, and an enhancer of modified nucleotide triphosphate incorporation, under conditions suitable for the incorporation of said compound into said oligonucleotide.

27. The process of claim 26, wherein said RNA polymerase is a T7 RNA polymerase.

28. The process of claim 26, wherein said RNA polymerase is a mutant T7 RNA polymerase.

29. The process of claim 26, wherein said RNA polymerase is a SP6 RNA polymerase.

30. The process of claim 26, wherein said RNA polymerase is a mutant SP6 RNA polymerase.

31. The process of claim 26, wherein said RNA polymerase is a T3 RNA polymerase.

32. The process of claim 26, wherein said RNA polymerase is a mutant T3 RNA polymerase.

33. The process of claim 26, wherein said enhancer of modified nucleotide triphosphate incorporation is selected from the group consisting of LiCl, methanol, polyethylene glycol, diethyl ether, propanol, methylamine, and ethanol.

34. A process for the synthesis of a pyrimidine nucleotide triphosphate comprising the steps of:

a. monophosphorylation, wherein a pyrimidine nucleoside is contacted with a mixture comprising a phosphorylating reagent, a trialkyl phosphate and dimethylaminopyridine, under conditions suitable for the formation of a pyrimidine nucleotide monophosphate; and

b. pyrophosphorylation, wherein said pyrimidine monophosphate from step (a) is contacted with a pyrophosphorylating reagent under conditions suitable for the formation of said pyrimidine nucleotide triphosphate.

35. The process of claim 34, wherein said pyrimidine nucleoside triphosphate is uridine triphosphate.

36. The process of claim 34, wherein said uridine triphosphate has a 2'-sugar modification.

37. The process of claim 36, wherein said uridine triphosphate is 2'-*O*-methylthiomethyl uridine triphosphate.

38. The process of claim 34, wherein said phosphorylating agent is selected from the group consisting of phosphorus oxychloride, phospho-tris-triazolides and phospho-tris-triimidazolides.

39. The process of claim 34, wherein said trialkylphosphate is triethyl phosphate.

40. The process of claim 34, wherein said pyrophosphorylating reagent is tributyl ammonium pyrophosphate.

41. The process of claim 26, wherein said oligonucleotide is RNA.

42. The process of claim 26, wherein said oligonucleotide is an enzymatic nucleic acid molecule.

43. The process of claim 26, wherein said oligonucleotide is an aptamer.

44. A kit for synthesis of an oligonucleotide comprising an RNA polymerase, an enhancer of modified nucleotide triphosphate incorporation and at least one compound of claim 25.

45. A kit for synthesis of an oligonucleotide comprising a DNA polymerase, an enhancer of modified nucleotide triphosphate incorporation and at least one compound of claim 25.

46. The kit of claim 44, wherein said RNA polymerase is a bacteriophage T7 RNA polymerase.

47. The kit of claim 44, wherein said RNA polymerase is a bacteriophage SP6 RNA polymerase.

48. The kit of claim 44, wherein said RNA polymerase is a bacteriophage T3 RNA polymerase.

49. The kit of claim 44, wherein said RNA polymerase is a mutant T7 RNA polymerase.

50. The kit of claim 44 or 45, wherein said kit comprises at least two different compounds of claim 25.

51. A nucleic acid catalyst comprising a histidyl modification, wherein said nucleic acid catalyst is able to catalyze an endonuclease reaction in the absence of a metal ion co-factor.

52. The nucleic acid catalyst of claim 51, wherein said catalyst is able to cleave a separate nucleic acid molecule.

53. The nucleic acid catalyst of claim 52, wherein said separate nucleic acid molecule is an RNA molecule.

54. The nucleic acid catalyst of claim 52, wherein said separate nucleic acid molecule is a DNA molecule.

55. The nucleic acid catalyst of claim 51, wherein said nucleic acid catalyst comprises at least one ribonucleotide.

56. The enzymatic nucleic acid molecule of claim 2, wherein said nucleic acid molecule has an endonuclease activity to cleave RNA of HER2 gene.

57. The enzymatic nucleic acid molecule of claim 56, wherein said nucleic acid molecule comprises sequences complementary to any of substrate sequences defined as Target sequence in Tables 58, 59 and 62.

58. The enzymatic nucleic acid molecule of claim 56, wherein said nucleic acid molecule comprises any of ribozyme sequences defined as Ribozyme sequence in Tables 58, 59 and 62.

59. A method for treating cancer using the enzymatic nucleic acid molecule of claim 56.

60. The method of claim 59, wherein said cancer is breast cancer.

61. A method for treating conditions associated with the level of HER2 gene using the enzymatic nucleic acid molecule of claim 56.

62. The enzymatic nucleic acid molecule of claim 56, wherein said enzymatic nucleic acid molecule comprises a substrate binding region which has between 5 and 30 nucleotides complementary to the RNA.

63. The enzymatic nucleic acid molecule of claim 56, wherein said enzymatic nucleic acid molecule comprises a substrate binding region which has between 7 and 12 nucleotides complementary to the RNA.

64. A mammalian cell including the enzymatic nucleic acid molecule of claim 56.

65. The mammalian cell of claim 64, wherein said mammalian cell is a human cell.

66. A mammalian cell including the enzymatic nucleic acid molecule of claims 1 or 2.

67. The mammalian cell of claim 66, wherein said mammalian cell is a human cell.

68. A method for inhibiting expression of HER2 gene in a cell, comprising the step of administering to said cell the enzymatic nucleic acid molecule of claim 56 under conditions suitable for said inhibition.

69. A method of cleaving RNA derived from HER2 gene comprising, contacting the enzymatic nucleic acid molecule of claim 56 with said RNA molecule under conditions suitable for the cleavage of said RNA molecule.

70. A pharmaceutical composition comprising the enzymatic nucleic acid molecule of any of claims 1 or 2.

71. A pharmaceutical composition comprising the enzymatic nucleic acid molecule of claim 56.

72. A method of treatment of a patient having a condition associated with the level of HER2, wherein said patient is administered the enzymatic nucleic acid molecule of claim 56 under conditions suitable for said treatment.

73. The method of claim 72, wherein said method is performed in conjunction with one or more other therapies.

74. The method of claim 59, wherein said enzymatic nucleic acid molecule is used in conjunction with one or more other therapies.

75. The enzymatic nucleic acid molecule of claim 56, wherein said enzymatic nucleic acid molecule comprises at least one sugar modification.

76. The enzymatic nucleic acid molecule of claim 56, wherein said enzymatic nucleic acid molecule comprises at least one nucleic acid base modification.

77. The enzymatic nucleic acid molecule of claim 56, wherein said enzymatic nucleic acid molecule comprises at least one phosphate backbone modification.

78. The enzymatic nucleic acid molecule of claim 56, wherein said phosphate backbone modification is selected from the group consisting of phosphorothioate, phosphorodithioate and amide.

79. An enzymatic nucleic acid molecule which down regulates expression of genes selected from the group consisting of beta site APP-cleaving enzyme (BACE) and telomerase reverse transciptase (TERT) genes.

80. The enzymatic nucleic acid molecule of claim 79, wherein said gene is the beta site APP-cleaving enzyme (BACE).

81. The enzymatic nucleic acid molecule of claim 79, wherein said gene is the telomerase reverse transcriptase (TERT).

82. A nucleic acid molecule which down regulates expression of genes selected from the group consisting of protein-tyrosine phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

83. The nucleic acid molecule of claim 82, wherein said nucleic acid molecule is an enzymatic nucleic acid molecule.

84. The nucleic acid molecule of claim 82, wherein said nucleic acid molecule is an antisense nucleic acid molecule.

85. The nucleic acid molecule of any of claims 82-84, wherein said gene is the protein-tyrosine phosphatase-1B (PTP-1B).

86. The nucleic acid molecule of any of claims 82-84, wherein said gene is the methionine aminopeptidase (MetAP-2).

87. The nucleic acid molecule of any of claims 82-84, wherein said gene is the hepatitis B virus (HBV).

88. The nucleic acid molecule of any of claims 82-84, wherein said gene is the phospholamban (PLN).

89. The nucleic acid molecule of any of claims 82-84, wherein said gene is the presenilin (ps-2).

90. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is adapted for use to treat diseases and conditions related to the expression of genes selected from the group consisting of beta site APP-cleaving enzyme (BACE), telomerase reverse transciptase (TERT), protein-tyrosine phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

91. The nucleic acid molecule of claim 82, wherein said nucleic acid molecule is adapted for use to treat diseases and conditions related to the expression of genes selected from the group consisting of protein-tyrosine phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

92. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule has an endonuclease activity to cleave RNA encoded by said beta site APP-cleaving enzyme (BACE), telomerase reverse transciptase (TERT), protein-tyrosine phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

93. The enzymatic nucleic acid of any of claims 79 or 83, wherein a binding arm of said enzymatic nucleic acid molecule comprise sequences complementary to any of the sequences defined as Target or Substrate sequence in Tables 3-30, and 36-43.

94. The enzymatic nucleic acid molecule of any of claims 79 or 83 wherein said enzymatic nucleic acid molecule comprises any of the sequences defined as Ribozyme or DNAzyme sequence in Tables 3-29, and 37-43.

95. The nucleic acid molecule of claim 84, wherein said antisense nucleic acid molecule comprises sequence complementary to any of the sequences defined as Target or Substrate sequence in Tables 3-12, 24-30, and 36-43.

96. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is in a hammerhead (HH) motif.

97. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is in a zinzyme (Class II) motif.

98. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is in a amberzyme (Class 1) motif.

99. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is in a hairpin, hepatitis Delta virus, group I intron, VS nucleic acid, or RNAse P nucleic acid motif.

100. The enzymatic nucleic acid molecule of claim 97, wherein said zinzyme motif comprises sequences complementary to any of the substrate sequences shown in Tables 21, 27 and 40.

101. The enzymatic nucleic acid molecule of claim 98, wherein said amberzyme motif comprises sequences complementary to any of the substrate sequences shown in Tables 23, 29, and 42.

102. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is in a NCH motif.

103. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is in a G-cleaver motif.

104. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule is a DNAzyme.

105. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule comprises between 12 and 100 bases complementary to the RNA of genes selected from the group consisting of beta site APP-cleaving enzyme (BACE), telomerase reverse transciptase (TERT), protein-tyrosine phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

106. The enzymatic nucleic acid of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule comprises between 14 and 24 bases complementary to the RNA of genes selected from the group consisting of beta site APP-cleaving enzyme (BACE), telomerase reverse transciptase (TERT), protein-tyrosine

phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

107. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid is chemically synthesized.

108. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid comprises at least one 2'-sugar modification.

109. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid comprises at least one nucleic acid base modification.

110. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid comprises at least one phosphate backbone modification.

111. A mammalian cell including the enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said mammalian cell is not a living human.

112. The mammalian cell of claim 111, wherein said mammalian cell is a human cell.

113. The antisense nucleic acid molecule of claim 84, wherein said antisense nucleic acid is chemically synthesized.

114. The antisense nucleic acid molecule of claim 84, wherein said antisense nucleic acid comprises at least one 2'-sugar modification.

115. The antisense nucleic acid molecule of claim 84, wherein said antisense nucleic acid comprises at least one nucleic acid base modification.

116. The antisense nucleic acid molecule of claim 84, wherein said antisense nucleic acid comprises at least one phosphate backbone modification.

117. A mammalian cell including the antisense nucleic acid molecule of claim 84, wherein said mammalian cell is not a living human.

118. The mammalian cell of claim 117, wherein said mammalian cell is a human cell.

119. A method of reducing BACE activity in a cell, comprising the step of contacting said cell with the enzymatic nucleic acid molecule of claim 80, under conditions suitable for said inhibition.

120. A method of reducing TERT activity in a cell, comprising the step of contacting said cell with the enzymatic nucleic acid molecule of claim 81, under conditions suitable for said inhibition.

121. A method of reducing PTP-1B activity in a cell, comprising the step of contacting said cell with the nucleic acid molecule of claim 85, under conditions suitable for said inhibition.

122. A method of reducing MetAP-2 activity in a cell, comprising the step of contacting said cell with the nucleic acid molecule of claim 86, under conditions suitable for said inhibition.

123. A method of reducing HBV activity in a cell, comprising the step of contacting said cell with the nucleic acid molecule of claim 87, under conditions suitable for said inhibition.

124. A method of reducing phospholamban (PLN) activity in a cell, comprising the step of contacting said cell with the nucleic acid molecule of claim 88, under conditions suitable for said inhibition.

125. A method of reducing presenilin-2 (ps-2) activity in a cell, comprising the step of contacting said cell with the nucleic acid molecule of claim 89, under conditions suitable for said inhibition.

126. A method of treatment of a patient having a condition associated with the level of BACE, comprising contacting cells of said patient with the enzymatic nucleic acid molecule of claim 80, under conditions suitable for said treatment.

127. A method of treatment of a patient having a condition associated with the level of TERT, comprising contacting cells of said patient with the enzymatic nucleic acid molecule of claim 81, under conditions suitable for said treatment.

128. A method of treatment of a patient having a condition associated with the level of PTP-1B, comprising contacting cells of said patient with the nucleic acid molecule of claim 85, under conditions suitable for said treatment.

129. A method of treatment of a patient having a condition associated with the level of MetAP-2, comprising contacting cells of said patient with the nucleic acid molecule of claim 86, under conditions suitable for said treatment.

130. A method of treatment of a patient having a condition associated with the level of HBV, comprising contacting cells of said patient with the nucleic acid molecule of claim 87, under conditions suitable for said treatment.

131. A method of treatment of a patient having a condition associated with the level of phospholamban (PLN), comprising contacting cells of said patient with the nucleic acid molecule of claim 88, under conditions suitable for said treatment.

132. A method of treatment of a patient having a condition associated with the level of presenilin-2 (ps-2), comprising contacting cells of said patient with the nucleic acid molecule of claim 89, under conditions suitable for said treatment.

133. The method of any of claims 126-132 further comprising the use of one or more drug therapies under conditions suitable for said treatment.

134. A method of cleaving RNA of BACE gene, comprising, contacting the enzymatic nucleic acid molecule of claim 80, with said RNA under conditions suitable for the cleavage of said RNA.

135. A method of cleaving RNA of TERT gene, comprising, contacting the enzymatic nucleic acid molecule of claim 81, with said RNA under conditions suitable for the cleavage of said RNA.

136. A method of cleaving RNA of PTP-1B gene, comprising, contacting the enzymatic nucleic acid molecule of claim 85, with said RNA under conditions suitable for the cleavage of said RNA.

137. A method of cleaving RNA of MetAP-2 gene, comprising, contacting the enzymatic nucleic acid molecule of claim 86, with said RNA under conditions suitable for the cleavage of said RNA.

138. A method of cleaving RNA of HBV gene, comprising, contacting the enzymatic nucleic acid molecule of claim 87, with said RNA under conditions suitable for the cleavage of said RNA.

139. A method of cleaving RNA of phospholamban (PLN) gene, comprising, contacting the enzymatic nucleic acid molecule of claim 88, with said RNA under conditions suitable for the cleavage of said RNA.

140. A method of cleaving RNA of presenilin-2 (ps-2) gene, comprising, contacting the enzymatic nucleic acid molecule of claim 89, with said RNA under conditions suitable for the cleavage of said RNA.

141. The method of any of claims 134-140, wherein said cleavage is carried out in the presence of a divalent cation.

142. The method of claim 141, wherein said divalent cation is Mg^{2+}.

143. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid comprises a cap structure, wherein the cap structure is at the 5'-end or 3'-end or both the 5'-end and the 3'-end.

144. The antisense nucleic acid molecule of claim 84, wherein said antisense nucleic acid comprises a cap structure, wherein the cap structure is at the 5'-end or 3'-end or both the 5'-end and the 3'-end.

145. The enzymatic nucleic acid molecule of claim 96, wherein said hammerhead motif comprises sequences complementary to any of sequences defined as Target or Substrate sequences in Tables 3, 9, 13, 18, 24, and 37.

146. The enzymatic nucleic acid molecule of claim 102, wherein said NCH motif comprises sequences complementary to any of sequences defined as Target or Substrate sequences in Tables 4, 10, 14, 19, 25, and 38.

147. The enzymatic nucleic acid molecule of claim 103, wherein said G-cleaver motif comprises sequences complementary to any of sequences defined as Target or Substrate sequences in Tables 5, 11, 15, 20, 26, and 39.

148. The enzymatic nucleic acid molecule of claim 104, wherein said DNAzyme comprises sequences complementary to any of sequences defined as Target or Substrate sequences in Tables 6, 16, 22, 28, and 41.

149. The method of any of claims 119-125 or 133, wherein said enzymatic nucleic acid molecule is in a hammerhead motif.

150. The method of any of claims 119-125 or 133, wherein said nucleic acid molecule is a DNAzyme.

151. An expression vector comprising nucleic acid sequence encoding at least one enzymatic nucleic acid molecule of any of claims 79 or 83, in a manner which allows expression of that enzymatic nucleic acid molecule.

152. An expression vector comprising nucleic acid sequence encoding at least one antisense nucleic acid molecule of claim 84, in a manner which allows expression of that antisense nucleic acid molecule.

153. A mammalian cell including an expression vector of any of claims 151 or 152, wherein said mammalian cell is not a living human.

154. The mammalian cell of claim 153, wherein said mammalian cell is a human cell.

155. The expression vector of claim 151, wherein said enzymatic nucleic acid molecule is in a hammerhead motif.

156. The expression vector of claim 151, wherein said expression vector further comprises a sequence for an antisense nucleic acid molecule complementary to the RNA of genes selected from the group consisting of beta site APP-cleaving enzyme (BACE), telomerase reverse transciptase (TERT), protein-tyrosine phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

157. The expression vector of claim 151, wherein said expression vector comprises sequence encoding at least two said enzymatic nucleic acid molecules, which may be same or different.

158. The expression vector of claim 157, wherein one said expression vector further comprises sequence encoding antisense nucleic acid molecule complementary to the RNA of genes selected from the group consisting of beta site APP-cleaving enzyme (BACE), telomerase reverse transciptase (TERT), protein-tyrosine phosphatase-1B (PTP-1B), methionine aminopeptidase (MetAP-2), hepatitis B virus (HBV), phospholamban (PLN), and presenilin (ps-2) genes.

159. A method for treatment of Alzheimer's disease comprising the step of administering to a patient the enzymatic nucleic acid molecule of claim 80 under conditions suitable for said treatment.

160. The method of claim 159, wherein said treatment of Alzheimer's disease is treatment of dementia.

161. A method for treatment of Alzheimer's disease comprising the step of administering to a patient the antisense nucleic acid molecule of claim 89 under conditions suitable for said treatment.

162. A method for treatment of diabetes comprising the step of administering to a patient the nucleic acid molecule of claim 85 under conditions suitable for said treatment.

163. The method of claim 162, wherein said diabetes is type I diabetes.

164. The method of claim 162, wherein said diabetes is type II diabetes.

165. A method for treatment of diabetes comprising the step of administering to a patient the antisense nucleic acid molecule of claim 85 under conditions suitable for said treatment.

166. A method for treatment of obesity comprising the step of administering to a patient the nucleic acid molecule of claim 85 under conditions suitable for said treatment.

167. A method for treatment of obesity comprising the step of administering to a patient the antisense nucleic acid molecule of claim 85 under conditions suitable for said treatment.

168. A method for treatment of heart disease comprising the step of administering to a patient the nucleic acid molecule of claim 88 under conditions suitable for said treatment.

169. The method of claim 168, wherein said heart disease is heart failure.

170. The method of claim 168, wherein said heart disease is congestive heart failure.

171. A method for treatment of pressure overload hypertrophy, or dilated cardiomyopathy, or both, comprising the step of administering to a patient the nucleic acid molecule of claim 88 under conditions suitable for said treatment.

172. A method for treatment of cancer comprising the step of administering to a patient the nucleic acid molecule of claim 86 under conditions suitable for said treatment.

173. A method for treatment of hepatitis comprising the step of administering to a patient the nucleic acid molecule of claim 87 under conditions suitable for said treatment.

174. A method for treatment of hepatocellular carcinoma comprising the step of administering to a patient the nucleic acid molecule of claim 87 under conditions suitable for said treatment.

175. The method of claim 159, wherein said enzymatic nucleic acid molecule is in a hammerhead motif.

176. The method of claim 159, wherein said method further comprises administering to said patient the enzymatic nucleic acid molecule in conjunction with one or more of other therapies.

177. The method of any of claims 162, 165-168, or 171-174, wherein said nucleic acid molecule is an enzymatic nucleic acid molecule.

178. The method of any of claims 162, 166-168, or 171-174, wherein said nucleic acid molecule is an antisense nucleic acid molecule.

179. The method of any of claims 162, 165-168, or 171-174, wherein said method further comprises administering to said patient the nucleic acid molecule in conjunction with one or more of other therapies.

180. The enzymatic nucleic acid molecule of any of claims 79 or 83, wherein said enzymatic nucleic acid molecule comprises at least five ribose residues; at least ten 2'-O-methyl modifications, and a 3'- end modification.

181. The enzymatic nucleic acid molecule of claim 180, wherein said enzymatic nucleic acid molecule further comprises phosphorothioate linkages on at least three of the 5' terminal nucleotides.

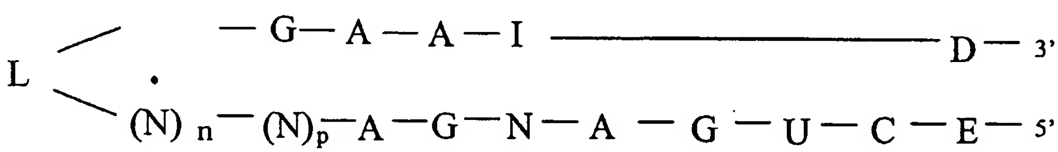
182. The enzymatic nucleic acid molecule of claim 180, wherein said 3'- end modification is 3'-3' inverted abasic moiety.

183. The enzymatic nucleic acid molecule of claim 104, wherein said DNAzyme comprises at least ten 2'-O-methyl modifications and a 3'-end modification.

184. The enzymatic nucleic acid molecule of claim 183, wherein said DNAzyme further comprises phosphorothioate linkages on at least three of the 5' terminal nucleotides.

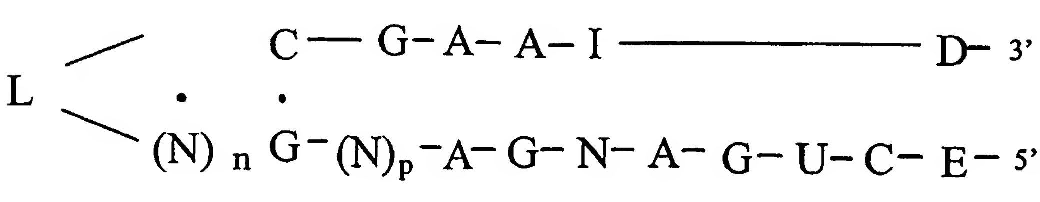
185. The enzymatic nucleic acid molecule of claim 183, wherein said 3'- end modification is 3'-3' inverted abasic moiety.

186. An enzymatic nucleic acid molecule having formula 1:



wherein N represents independently a nucleotide or a non-nucleotide linker, which may be same or different; D and E are independently oligonucleotides of length sufficient to stably interact with a target RNA molecule; o and n are integers independently greater than or equal to 1, wherein if (N)o and (N)n are nucleotides, (N)o and (N)n are optionally able to interact by hydrogen bond interaction; • indicates base-paired interaction; L is a linker which may be present or absent, but when present, is a nucleotide linker, a non-nucleotide linker, or a combination of nucleotide and a non-nucleotide linker; p is an integer 0 or 1; represents a chemical linkage; and A, U, I, C and G represent adenosine, uridine, inosine, cytidine and guanosine nucleotides, respectively.

187. An enzymatic nucleic acid molecule having formula 2:



wherein N represents independently a nucleotide or a non-nucleotide linker, which may be same or different; D and E are independently oligonucleotides of length sufficient to stably interact with a target RNA molecule; o and n are integers independently greater than or equal to 0, wherein if (N)o and (N)n are nucleotides,

(N)o and (N)n are optionally able to interact by hydrogen bond interaction; • indicates base-paired interaction; L is a linker which may be present or absent, but when present, is a nucleotide linker, a non-nucleotide linker, or a combination of nucleotide and a non-nucleotide linker; p is an integer 0 or 1; represents a chemical linkage; and A, U, I, C and G represent adenosine, uridine, inosine, cytidine and guanosine nucleotides, respectively.

188. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said D and E are independently of length selected from the group consisting of 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, and 20 nucleotides.

189. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said D and E are of the same length.

190. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said D and E are of different length.

191. The enzymatic nucleic acid molecule of claim 186, wherein said o and n are independently integers selected from the group consisting of 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, and 50.

192. The enzymatic nucleic acid molecule of claim 187, wherein said o and n are independently integers selected from the group consisting of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, and 50.

193. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said (N)o and (N)n comprise nucleotides that are complementary to each other.

194. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said (N)o and (N)n are of the same length.

195. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said (N)o and (N)n are of different length.

196. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said L is a nucleotide linker.

197. The enzymatic nucleic acid molecule of claim 196, wherein said nucleotide linker is of length between 3-50 nucleotides.

198. The enzymatic nucleic acid molecule of claim 196, wherein said nucleotide linker is an aptamer.

199. The enzymatic nucleic acid molecule of claim 196 wherein said nucleotide linker is selected from the group consisting of 5'-GAAA-3' and 5'-GUUA-3'.

200. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said L is a non-nucleotide linker.

201. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said chemical linkage is independently or in combination selected from the group consisting of phosphate ester linkage, amide linkage, phosphorothioate, arabino, arabinofluoro, and phosphorodithioate.

202. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said p is 1.

203. The enzymatic nucleic acid molecule of claim 202, wherein said N of (N)p is independently selected from the group consisting of adenosine, uridine, and cytidine.

204. The enzymatic nucleic acid molecule of claims 186 or 187 wherein said enzymatic nucleic acid molecule is chemically synthesized.

205. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said enzymatic nucleic acid molecule comprises at least three ribonucleotide residues.

206. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said enzymatic nucleic acid molecule comprises at least four ribonucleotide residues.

207. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said enzymatic nucleic acid molecule comprises at least five ribonucleotide residues.

208. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said I is selected from the group consisting of ribo-inosine and xylo-inosine.

209. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said enzymatic nucleic acid molecule comprises at least one sugar modification.

210. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said enzymatic nucleic acid molecule comprises at least nucleic acid base modification.

211. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said enzymatic nucleic acid molecule comprises at least one phosphate backbone modification.

212. The enzymatic nucleic acid molecule of claim 209, wherein said sugar modification is selected from the group consisting of 2'-H, 2'-O-methyl, 2'-O-allyl, and 2'-deoxy-2'-amino.

213. The enzymatic nucleic acid molecule of claim 211, wherein said phosphate backbone modification is selected from the group consisting of phosphorothioate, phosphorodithioate and amide.

214. The enzymatic nucleic acid molecule of claims 186 or 187 wherein said enzymatic nucleic acid molecule comprises a 5'-cap or a 3'-cap or both a 5'-cap and a 3'-cap.

215. The enzymatic nucleic acid molecule of claim 214, wherein said 5'-cap is a phosphorothioate modification of at least one 5'-terminal nucleotide in said enzymatic nucleic acid molecule.

216. The enzymatic nucleic acid molecule of claim 214, wherein said 5'-cap is a phosphorothioate modification of at least two 5'-terminal nucleotide in said enzymatic nucleic acid molecule.

217. The enzymatic nucleic acid molecule of claim 214, wherein said 5'-cap is a phosphorothioate modification of at least three 5'-terminal nucleotide in said enzymatic nucleic acid molecule.

218. The enzymatic nucleic acid molecule of claim 214, wherein said 3'-cap is a 3'-3' inverted abasic moiety.

219. The enzymatic nucleic acid molecule of claim 214, wherein said 3'-cap is a 3'-3' inverted nucleotide moiety.

220. A method for inhibiting expression of a gene in a cell, comprising the step of administering to said cell the enzymatic nucleic acid molecule of claims 186 or 187 under conditions suitable for said inhibition.

221. A method of cleaving a separate RNA molecule comprising, contacting the enzymatic nucleic acid molecule of claims 186 or 187 with said separate RNA

molecule under conditions suitable for the cleavage of said separate RNA molecule.

222. The method of claim 221, wherein said cleavage is carried out in the presence of a divalent cation.

223. The method of claim 222, wherein said divalent cation is $Mg2+$.

224. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said enzymatic nucleic acid molecule has an endonuclease activity to cleave RNA derived from HER2 gene.

225. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule comprises sequences complementary to any of NCH substrate sequence of Table 34.

226. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule comprises any of the NCH ribozyme sequences shown in Table 34.

227. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule is used to treat cancer.

228. The enzymatic nucleic acid molecule of claim 224, wherein said cancer is breast cancer.

229. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule is used to treat conditions associated with the level of HER2 gene.

230. An enzymatic nucleic acid molecule, wherein said enzymatic nucleic acid molecule comprises any of sequence shown as NCH ribozyme sequence in Table 31.

231. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule comprises a substrate binding region which has between 5 and 30 nucleotides complementary to the RNA.

232. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule comprises a substrate binding region which has between 7 and 12 nucleotides complementary to the RNA.

233. A mammalian cell including the enzymatic nucleic acid molecule of claim 224, wherein said mammalian cell is not a living human.

234. The mammalian cell of claim 233, wherein said mammalian cell is a human cell.

235. A mammalian cell including the enzymatic nucleic acid molecule of claims 186 or 187, wherein said mammalian cell is not a living human.

236. The mammalian cell of claim 235, wherein said mammalian cell is a human cell.

237. A method for inhibiting expression of HER2 gene in a cell, comprising the step of administering to said cell the enzymatic nucleic acid molecule of claim 224 under conditions suitable for said inhibition.

238. A method of cleaving RNA derived from HER2 gene comprising, contacting the enzymatic nucleic acid molecule of claim 224 with said RNA molecule under conditions suitable for the cleavage of said RNA molecule.

239. A pharmaceutical composition comprising the enzymatic nucleic acid molecule of any of claims 186 or 187.

240. A pharmaceutical composition comprising the enzymatic nucleic acid molecule of claim 224.

241. A method of treatment of a patient having a condition associated with the level of HER2, wherein said patient is administered the enzymatic nucleic acid molecule of claim 224 under conditions suitable for said treatment.

242. The method of claim 241, wherein said method is performed in conjunction with one or more other therapies.

243. The enzymatic nucleic acid molecule of claim 227, wherein said enzymatic nucleic acid molecule is used in conjunction with one or more other therapies.

244. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said nucleic acid molecule comprises at least five ribose residues; a 2'-C-allyl modification at position No. 4 of said enzymatic nucleic acid; at least ten 2'-O-alkyl modifications, and a 3'- cap structure.

245. The enzymatic nucleic acid molecule of claim 244, wherein said 2'-O-alkyl modifications is selected from the group consisting of 2'-O-methyl and 2'-O-allyl.

246. The enzymatic nucleic acid molecule of claim 244, wherein said 3'-cap is 3'-3' inverted abasic moiety.

247. The enzymatic nucleic acid molecule of claim 244, wherein said 3'-cap is 3'-3' inverted nucleotide.

248. The enzymatic nucleic acid molecule of claim 244, wherein said enzymatic nucleic acid comprises phosphorothioate linkages in at least three of the 5' terminal nucleotides.

249. The enzymatic nucleic acid molecule of claims 186 or 187, wherein said nucleic acid molecule comprises at least five ribose residues; a 2'-deoxy-2'-amino modification at position Nos. 4 and 7 of said enzymatic nucleic acid; at least ten 2'-O-alkyl modifications, and a 3'- cap structure.

250. The enzymatic nucleic acid molecule of claim 249, wherein said 2'-O-alkyl modifications is selected from the group consisting of 2'-O-methyl and 2'-O-allyl.

251. The enzymatic nucleic acid molecule of claim 249, wherein said 3'-cap is 3'-3' inverted abasic moiety.

252. The enzymatic nucleic acid molecule of claim 249, wherein said 3'-cap is 3'-3' inverted nucleotide.

253. The enzymatic nucleic acid molecule of claim 249, wherein said enzymatic nucleic acid comprises phosphorothioate linkages in at least three of the 5' terminal nucleotides.

254. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule comprises at least one sugar modification.

255. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule comprises at least one nucleic acid base modification.

256. The enzymatic nucleic acid molecule of claim 224, wherein said enzymatic nucleic acid molecule comprises at least one phosphate backbone modification.

257. The enzymatic nucleic acid molecule of claim 224, wherein said phosphate backbone modification is selected from the group consisting of phosphorothioate, phosphorodithioate and amide.

258. The enzymatic nucleic acid molecule of claim 224, wherein said nucleic acid molecule comprises at least five ribose residues; a 2'-C-allyl modification at position No. 4 of said enzymatic nucleic acid; at least ten 2'-O-alkyl modifications, and a 3'- cap structure.

259. The enzymatic nucleic acid molecule of claim 258, wherein said 2'-O-alkyl modifications is selected from the group consisting of 2'-O-methyl and 2'-O-allyl.

260. The enzymatic nucleic acid molecule of claim 258, wherein said 3'-cap is 3'-3' inverted abasic moiety.

261. The enzymatic nucleic acid molecule of claim 258, wherein said 3'-cap is 3'-3' inverted nucleotide.

262. The enzymatic nucleic acid molecule of claim 258, wherein said enzymatic nucleic acid comprises phosphorothioate linkages in at least three of the 5' terminal nucleotides.

263. The enzymatic nucleic acid molecule of claim 224, wherein said nucleic acid molecule comprises at least five ribose residues; a 2'-deoxy-2'-amino modification at position Nos. 4 and 7 of said enzymatic nucleic acid; at least ten 2'-O-alkyl modifications, and a 3'- cap structure.

264. The enzymatic nucleic acid molecule of claim 263, wherein said 2'-O-alkyl modifications is selected from the group consisting of 2'-O-methyl and 2'-O-allyl.

265. The enzymatic nucleic acid molecule of claim 263, wherein said 3'-cap is 3'-3' inverted abasic moiety.

266. The enzymatic nucleic acid molecule of claim 263, wherein said 3'-cap is 3'-3' inverted nucleotide.

267. The enzymatic nucleic acid molecule of claim 263, wherein said enzymatic nucleic acid comprises phosphorothioate linkages in at least three of the 5' terminal nucleotides.

268. The enzymatic nucleic acid molecule of claim 186, wherein said enzymatic nucleic acid molecule is capable of down-regulating the expression of protein kinase C alpha (PKC alpha) gene.

269. A method for inhibiting expression of a PKC alpha gene in a cell, comprising the step of administering to said cell the enzymatic nucleic acid molecule of claim 268 under conditions suitable for said inhibition.

270. A method of cleaving a PKC alpha RNA molecule comprising, contacting the enzymatic nucleic acid molecule of claim 268 with said separate PKC alpha RNA molecule under conditions suitable for the cleavage of said PKC alpha RNA molecule.

271. The method of claim 270, wherein said cleavage is carried out in the presence of a divalent cation.

272. The method of claim 271, wherein said divalent cation is Mg2+.

273. The enzymatic nucleic acid molecule of claim 268, wherein said enzymatic nucleic acid molecule has an endonuclease activity to cleave RNA derived from PKC alpha gene.

274. The enzymatic nucleic acid molecule of claim 273, wherein said enzymatic nucleic acid molecule comprises sequences complementary to any of NCH substrate sequence of Table 63.

275. The enzymatic nucleic acid molecule of claim 273 wherein said enzymatic nucleic acid molecule comprises any of the NCH ribozyme sequences shown in Table 63.

276. The enzymatic nucleic acid molecule of claim 268, wherein said enzymatic nucleic acid molecule is used to treat cancer.

277. The enzymatic nucleic acid molecule of claim 276, wherein said cancer is selected from the group consisting of lung, breast, colon, prostate, bladder, ovary, melanoma, and glioblastoma cancer.

278. The enzymatic nucleic acid molecule of claim 268, wherein said enzymatic nucleic acid molecule is used to treat conditions associated with the level of PKC alpha gene.

279. The enzymatic nucleic acid molecule of claim 268, wherein said D and E independently has between 5 and 30 nucleotides complementary to the RNA.

280. The enzymatic nucleic acid molecule of claim 268, wherein said D and E independently has between 7 and 12 nucleotides complementary to the RNA.

281. A mammalian cell including the enzymatic nucleic acid molecule of claim 268, wherein said mammalian cell is not a living human.

282. The mammalian cell of claim 281, wherein said mammalian cell is a human cell.

283. A pharmaceutical composition comprising the enzymatic nucleic acid molecule of claim 238.

284. A pharmaceutical composition comprising the enzymatic nucleic acid molecule of claim 273.

285. A method of treatment of a patient having a condition associated with the level of PKC alpha, wherein said patient is administered the enzymatic nucleic acid molecule of claim 268 under conditions suitable for said treatment.

286. The method of claim 285, wherein said method is performed in conjunction with one or more other therapies.

287. The enzymatic nucleic acid molecule of claim 286, wherein said enzymatic nucleic acid molecule is used in conjunction with one or more other therapies.

288. An antisense nucleic acid molecule comprising sequence complementary to any of substrate sequence in Tables 13-23.

289. The antisense nucleic acid molecule of claim 288, wherein said enzymatic nucleic acid is chemically synthesized.

290. The antisense nucleic acid molecule of claim 288, wherein said antisense nucleic acid comprises at least one 2'-sugar modification.

291. The antisense nucleic acid molecule of claim 288, wherein said antisense nucleic acid comprises at least one nucleic acid base modification.

292. The antisense nucleic acid molecule of claim 288, wherein said antisense nucleic acid comprises at least one phosphate backbone modification.

293. A mammalian cell including the antisense nucleic acid molecule of claim 288, wherein said mammalian cell is not a living human.

294. The mammalian cell of claim 293, wherein said mammalian cell is a human cell.

Figure 1: Ribozyme Motifs

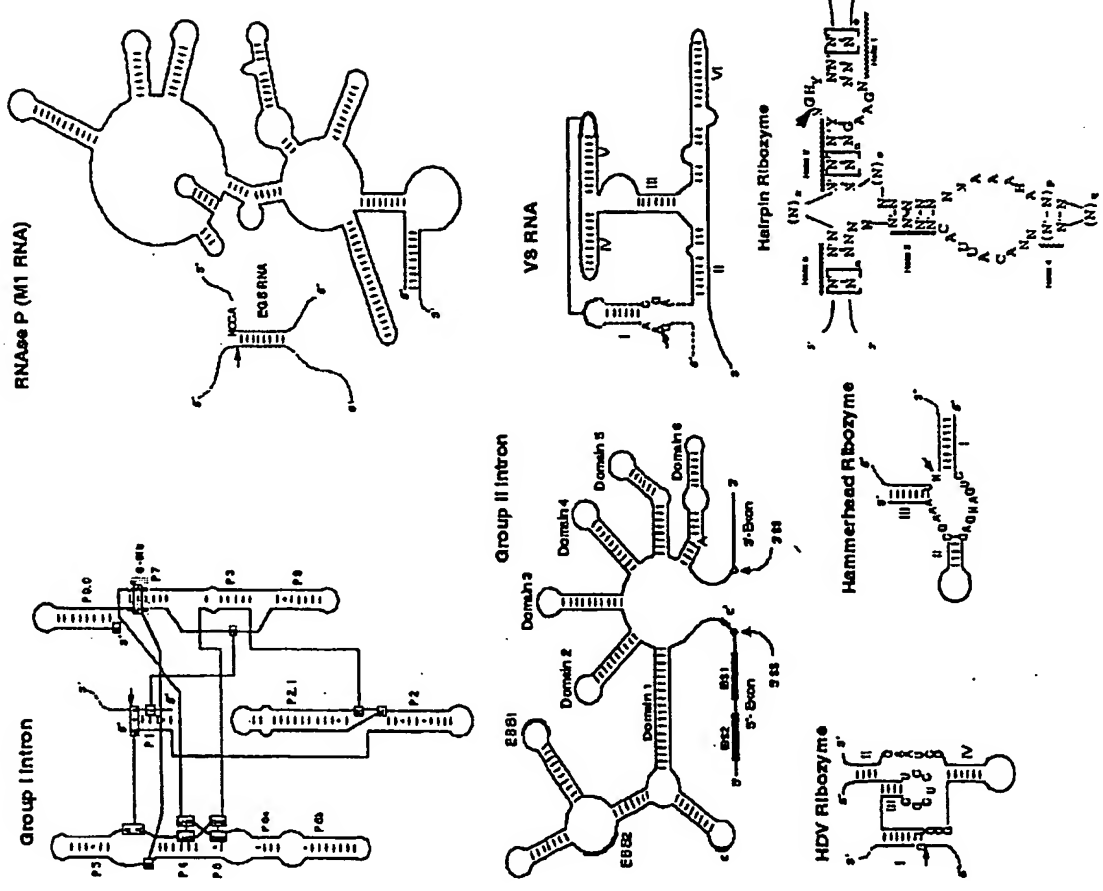


Figure 2: Examples of Nuclease Stable Ribozyme Motifs

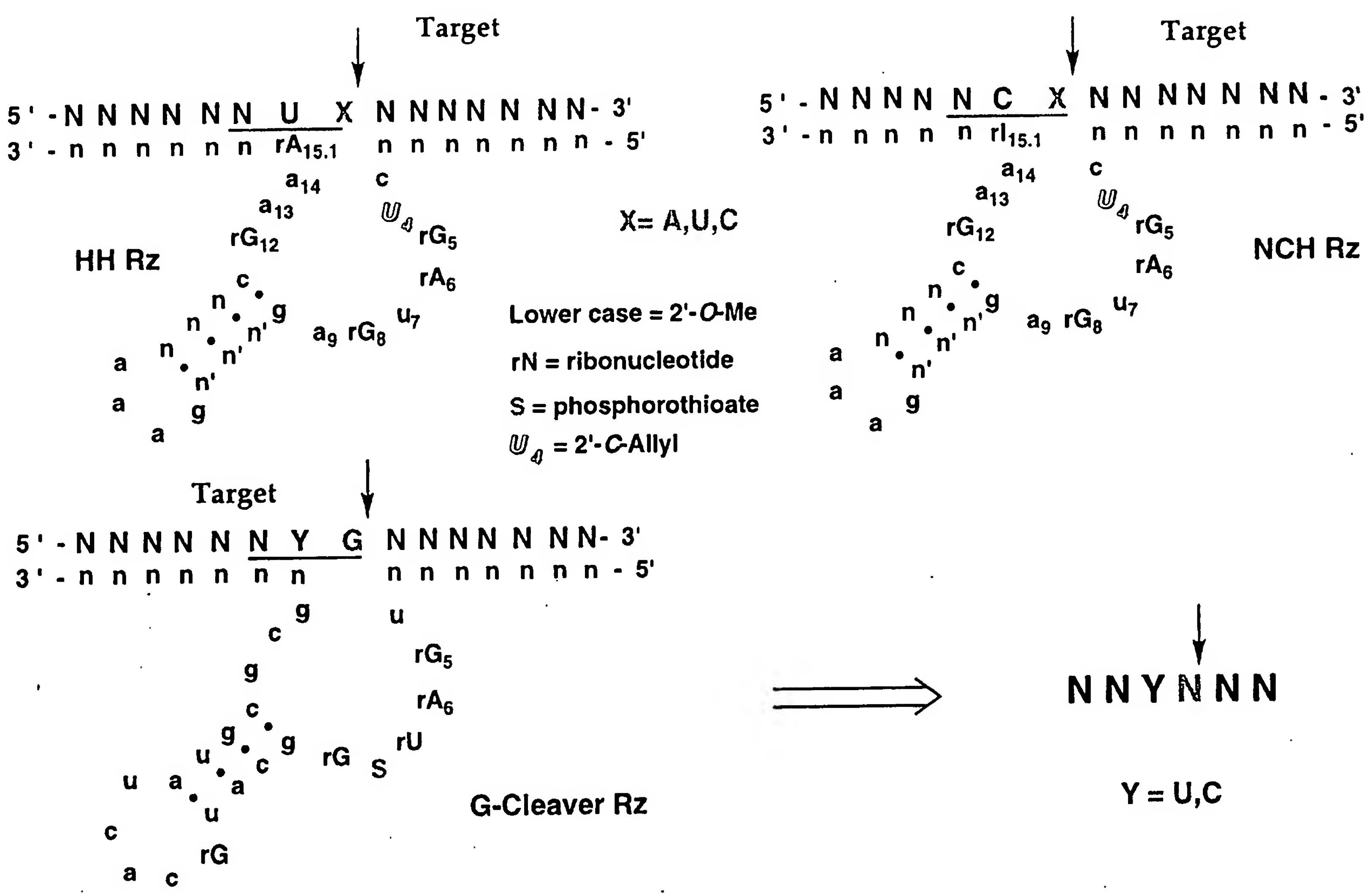


Figure 3: 2'-*O*-Me substituted Amberzyme Enzymatic Nucleic Acid Motif

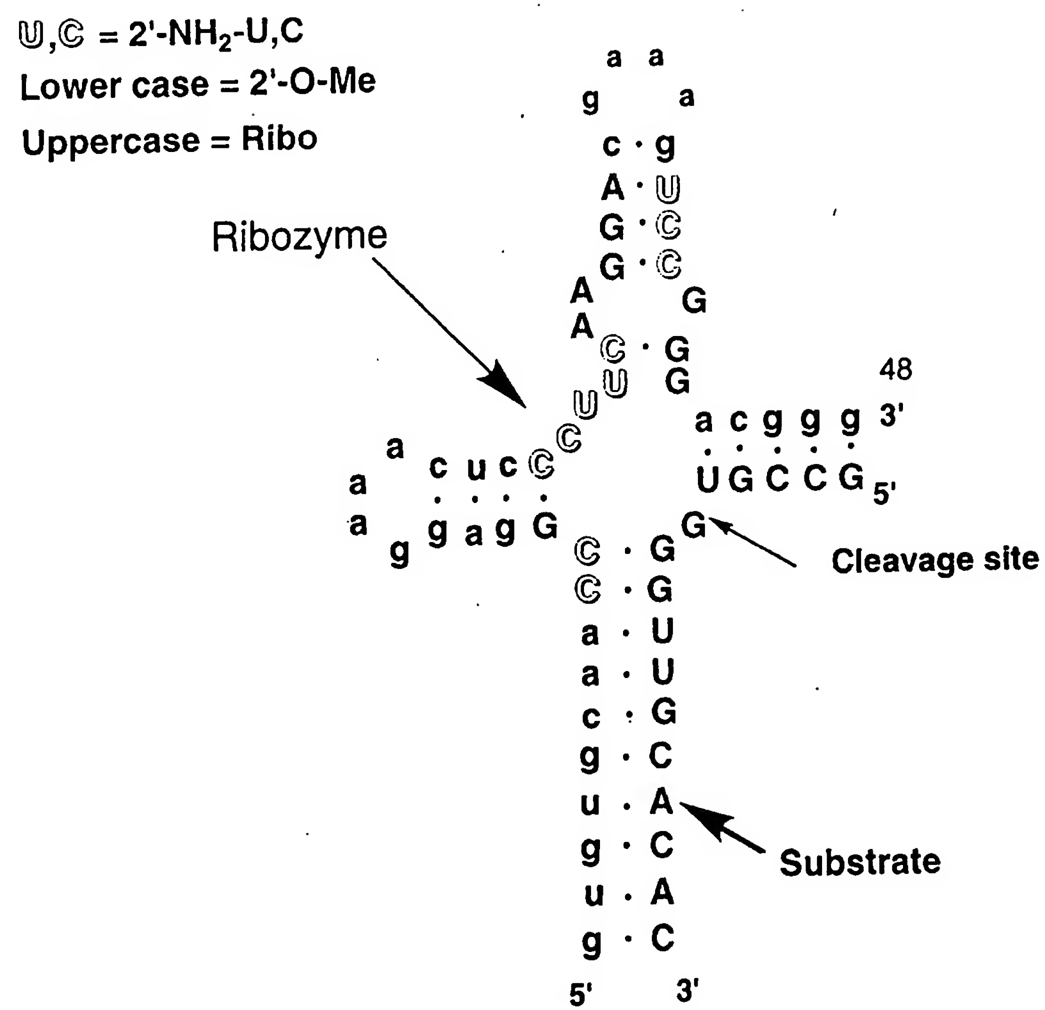
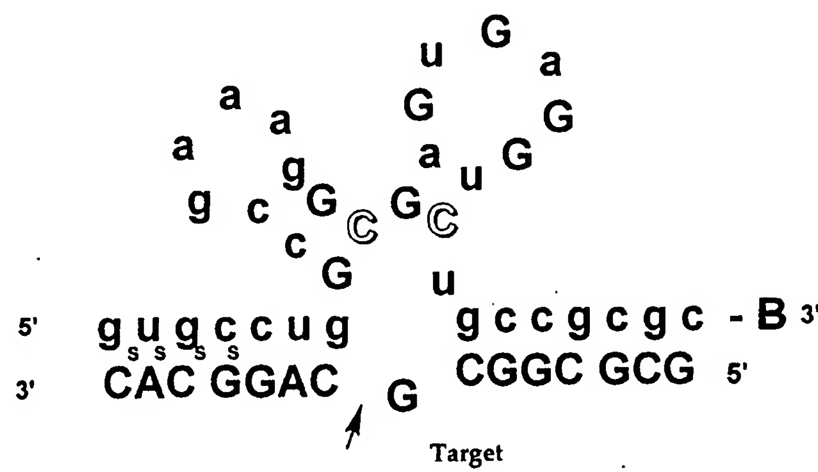


Figure 4: Stabilized Zinzyme Ribozyme Motif

Zinzyme A-motif RZ



Legend

Uppercase indicates natural ribo residues

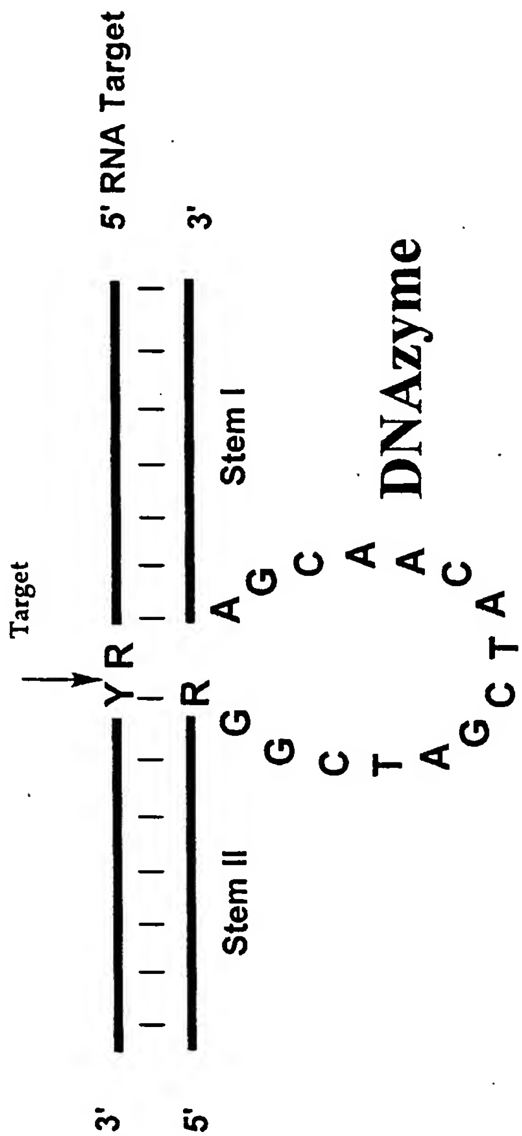
C indicates 2' - d-NH_2-C

Lowercase: 2'-*O*- Me

Subscript $_s$ indicates phosphothioate linkage

B: 3'-3' abasic moiety

Figure 5: DNAzyme Motif



Legend
Y = U or C
R = A or G

Figure 6: Ribozyme Motifs

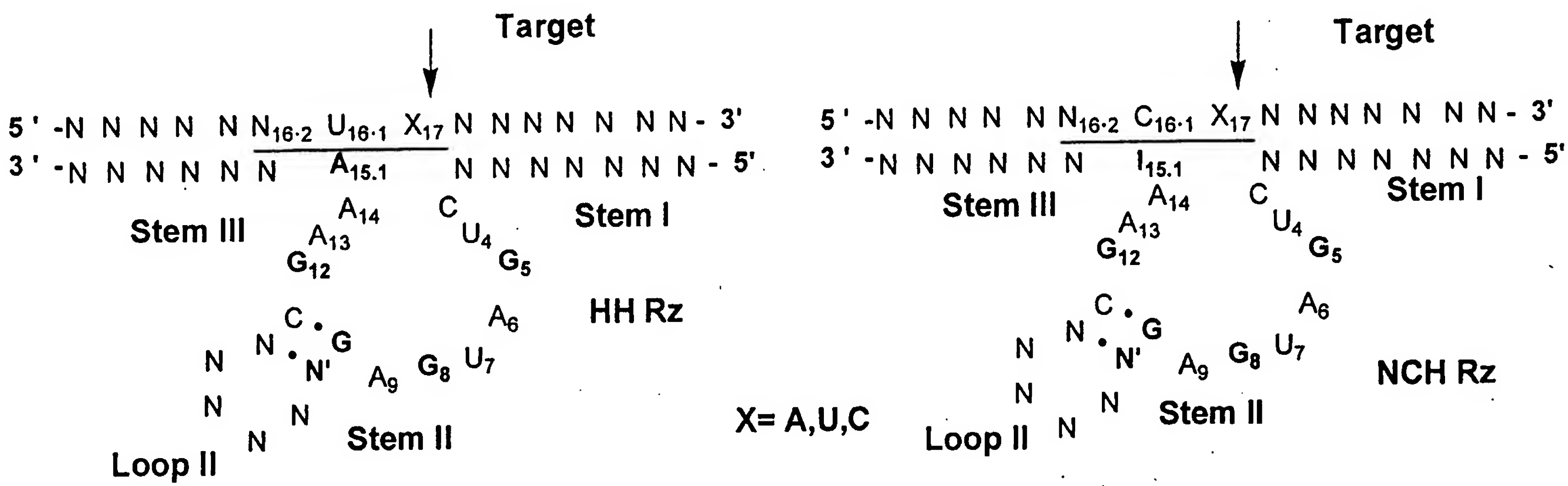
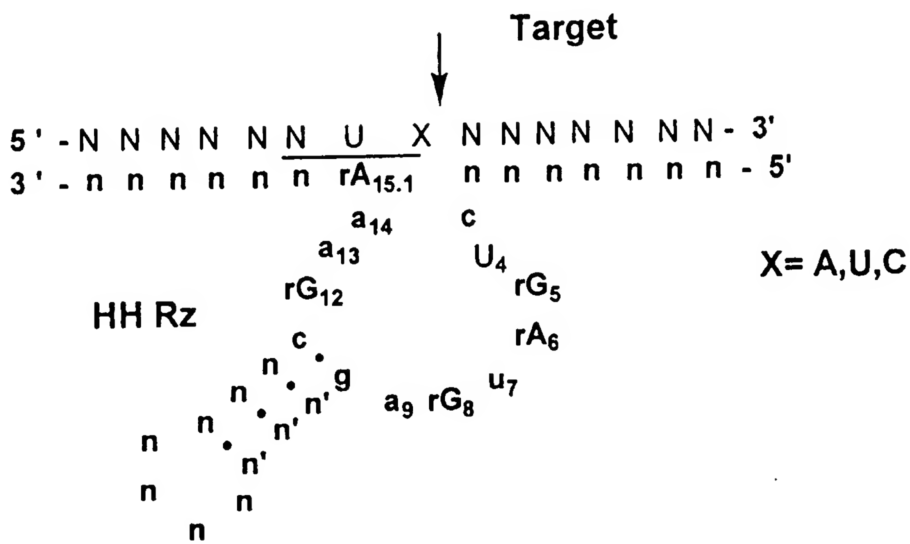
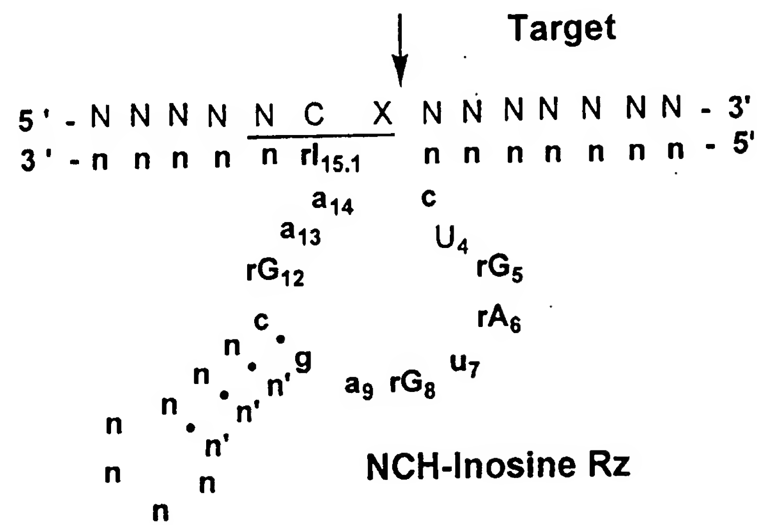
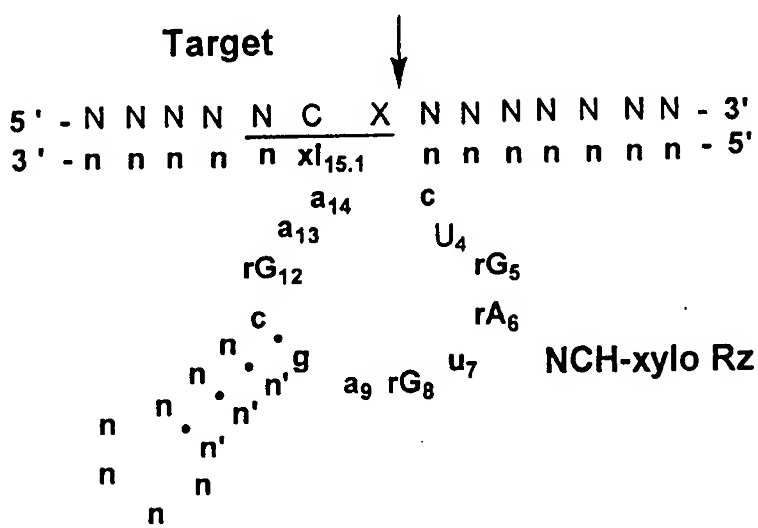


Figure 7: Examples of Nuclease Stable Ribozyme Motifs







Lower case = 2'-*O*-Me

rN = ribonucleotide

S = phosphorothioate

U_4 = 2'-*C*-Allyl

xI = xylo Inosine modification

rI = ribo Inosine modification

Figure 8: Inhibition of Cell Proliferation by Anti-Her2 Ribozymes

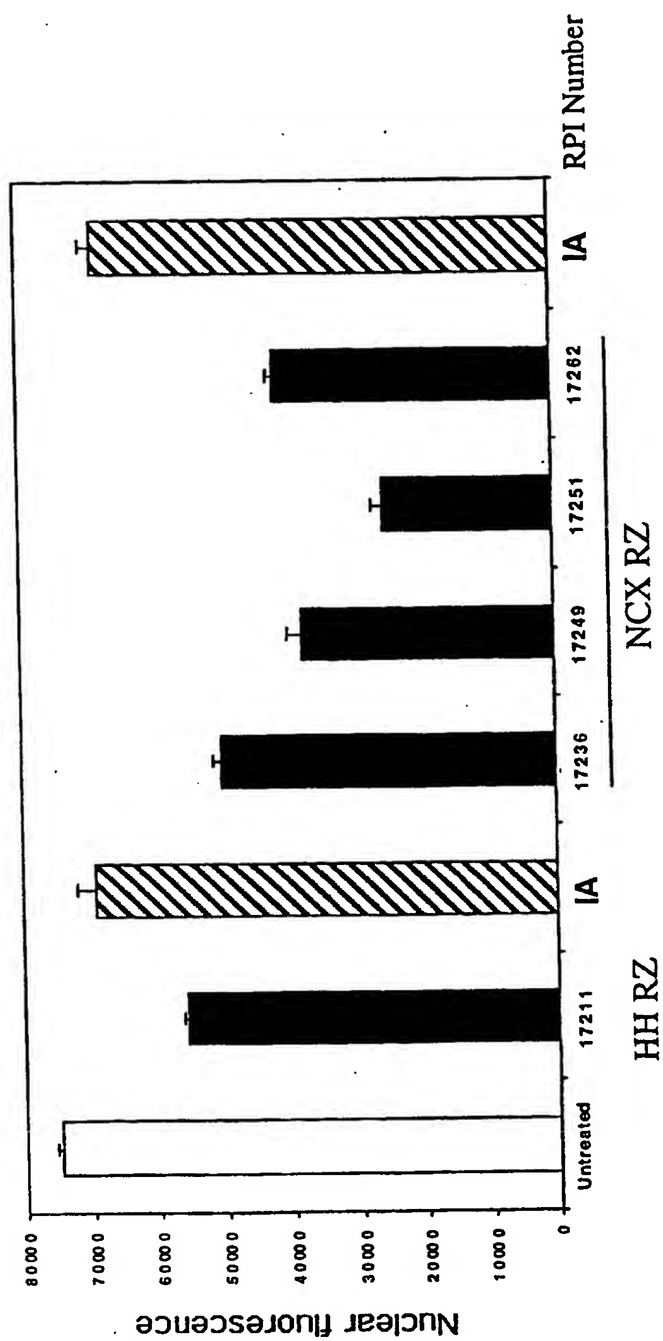
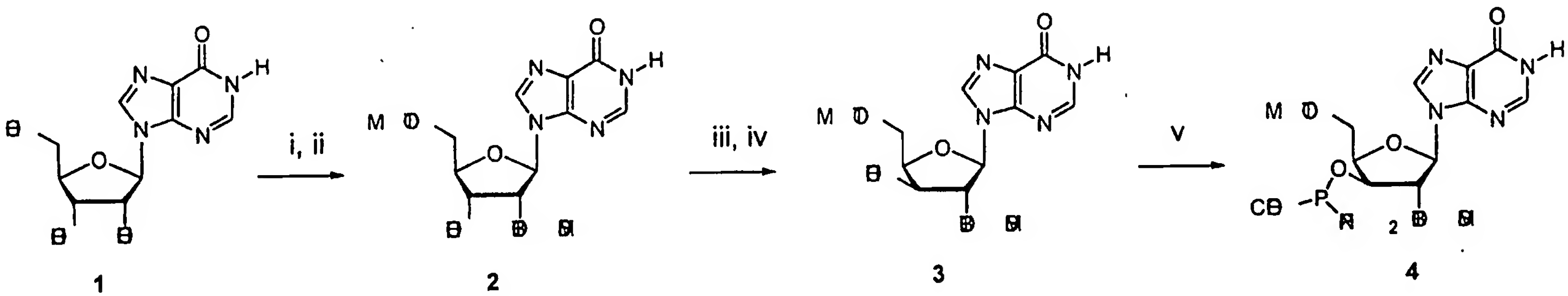


Figure 9: Synthesis of b-D-xylofuranosyl hypoxantine 3'-phosphoramidite



MMT = 4-methoxytriphenylmethyl
TBDMS = *t*-butyldimethylsilyl

<u>Reagents and Conditions</u>: (i) MMT-Cl/Pyr-DMSO, rt, 48 h; (ii) TBDMS-Cl/$AgNO_3$/Pyr/THF; (iii) CrO_3/Pyr/Ac_2O/DCM, rt, 1 h ; (iv) $NaB(OAc)_3H$/EtOH, rt, overnight; (v) 2-Cyanoethyl-*N,N*-diisopropylchlorophosphoramidite/1-MeIm/DIPEA/DCM, rt, 2 h.

Figure 10: One-Pot Formation of Nucleoside-5'-triphosphates

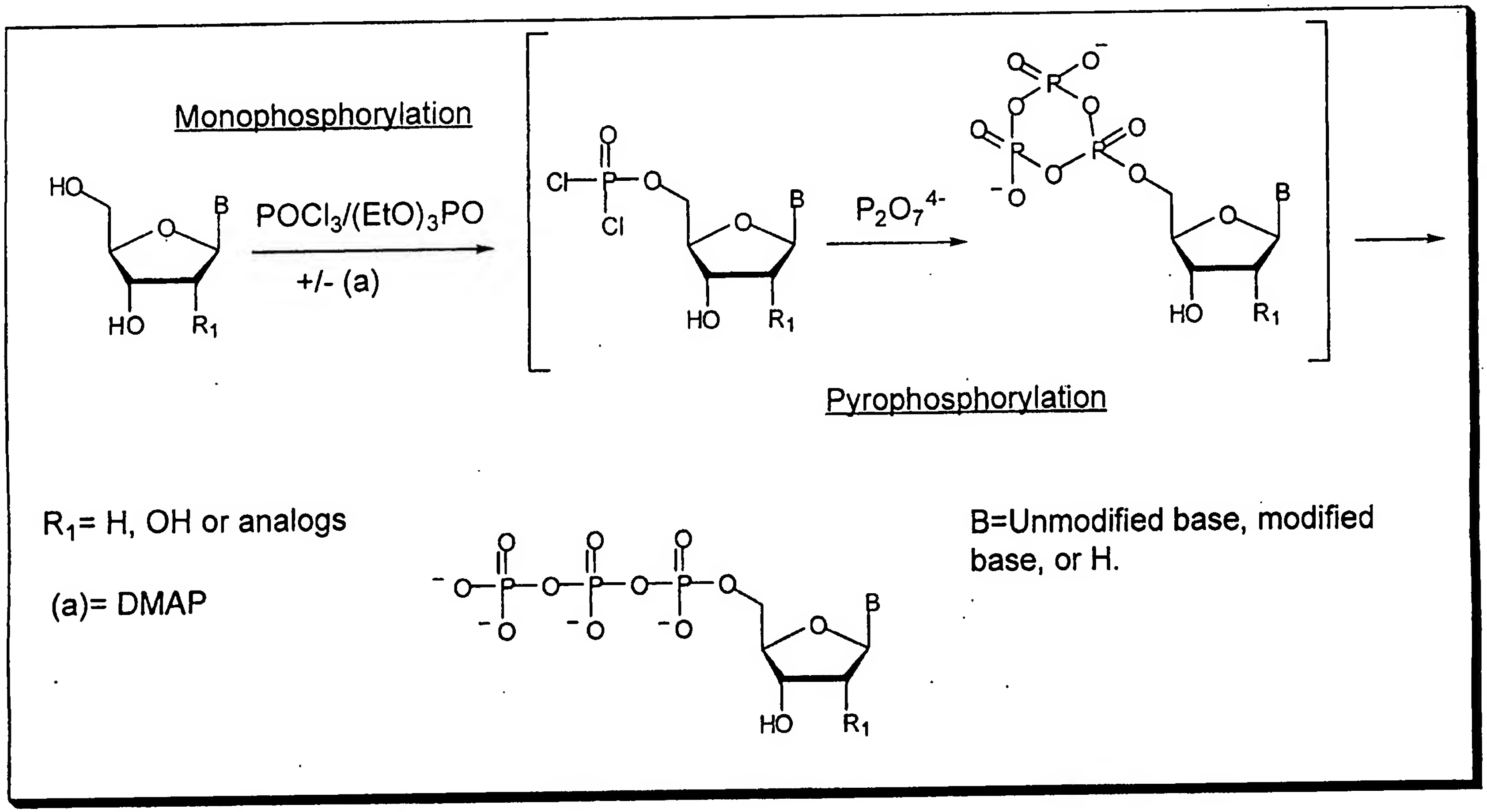
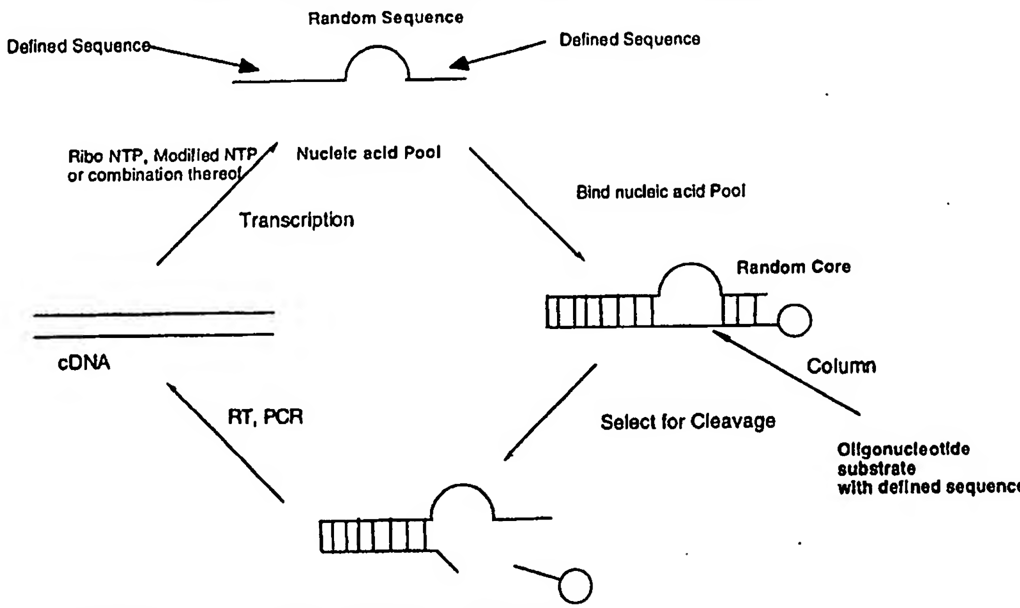


Figure 11

In Vitro Selection in "trans" format



In Vitro Selection of Trans Acting Nucleic Acid Catalysts

Figure 12. Removal of "parasitic RNA" using a Second Selection column

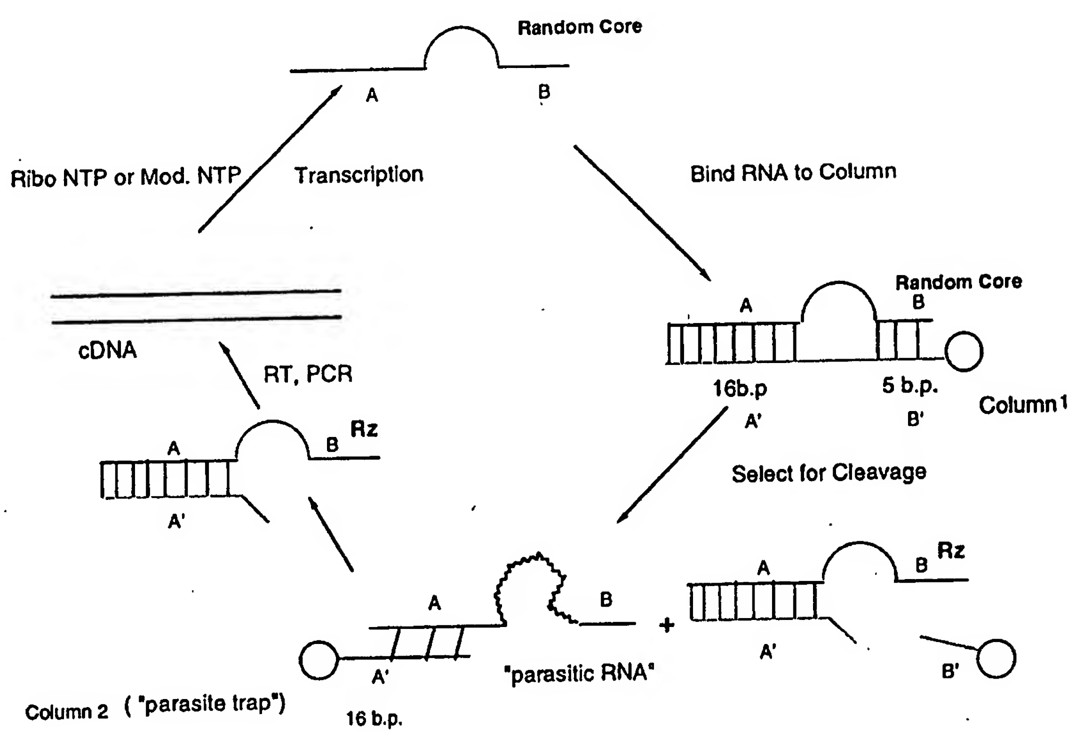


Figure 13. 2'-*O*-Me Stabilization of a Class I Enzymatic Nucleic Acid Motif

$\mathbb{U}$,$\mathbb{C}$ = 2'-NH_2-U,C

Lower case = 2'-O-Me

Uppercase = Ribo

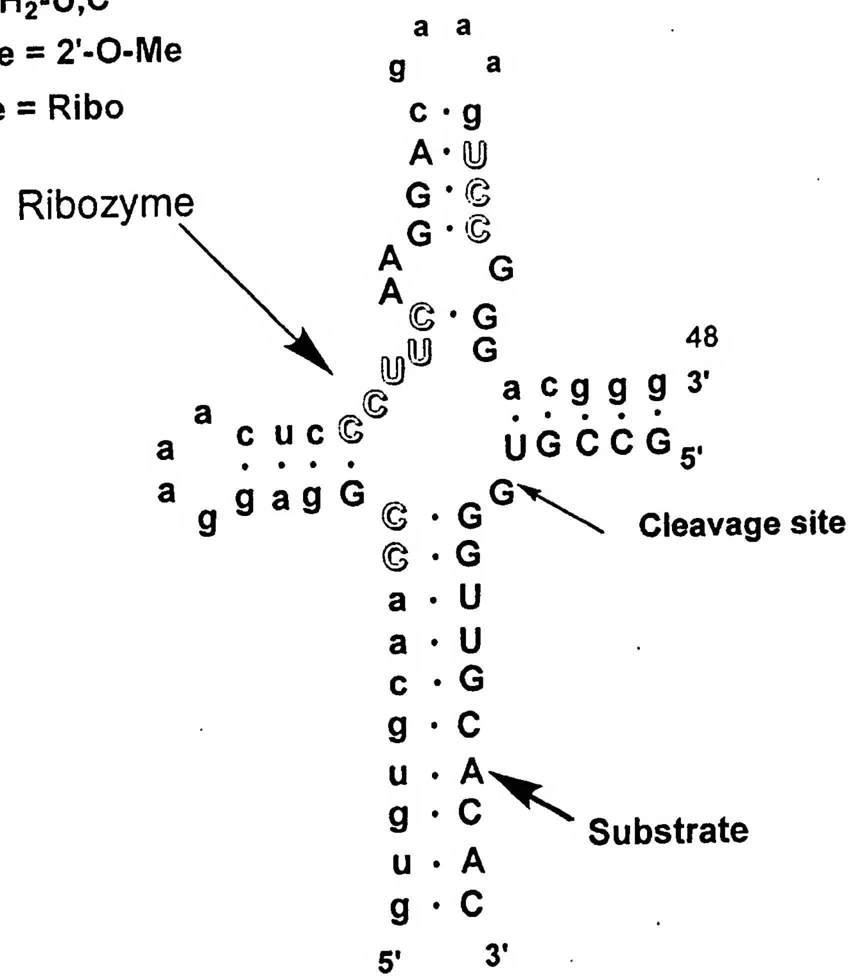


FIGURE 14. Dual Reporter System for Cytoplasmic HCV Target

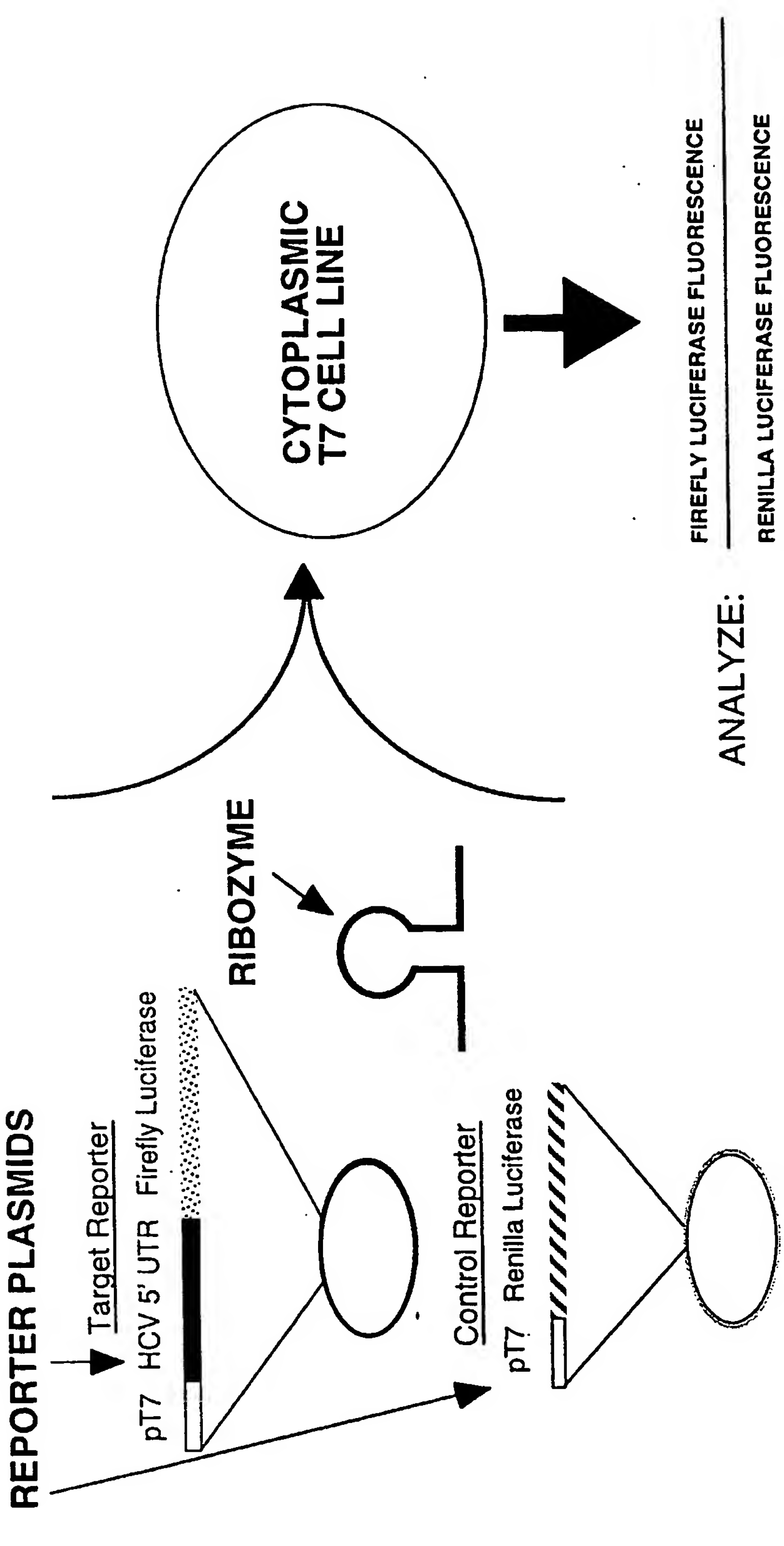


Figure 15. Dose-dependent inhibition of HCV-IRES mediated luciferase activity

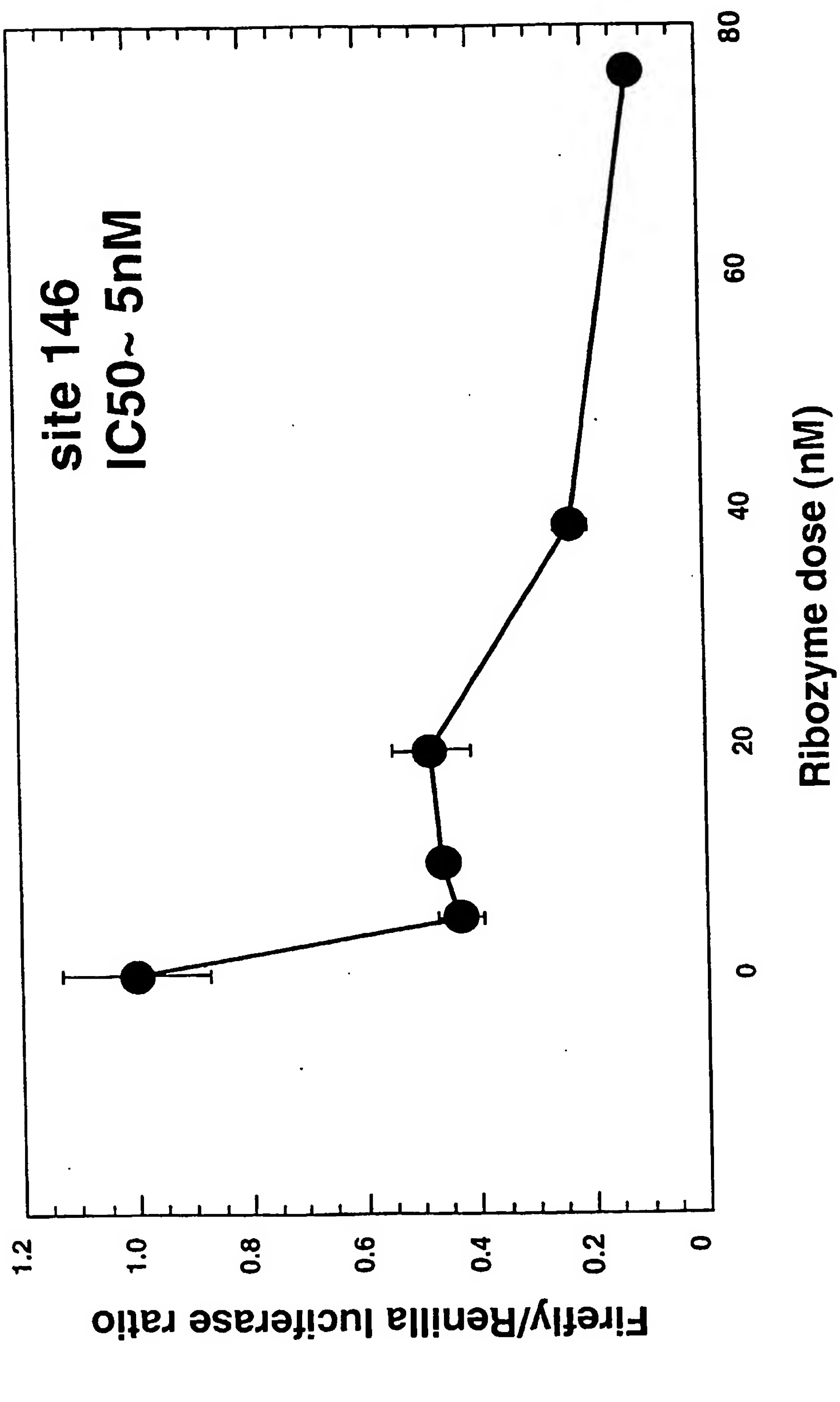
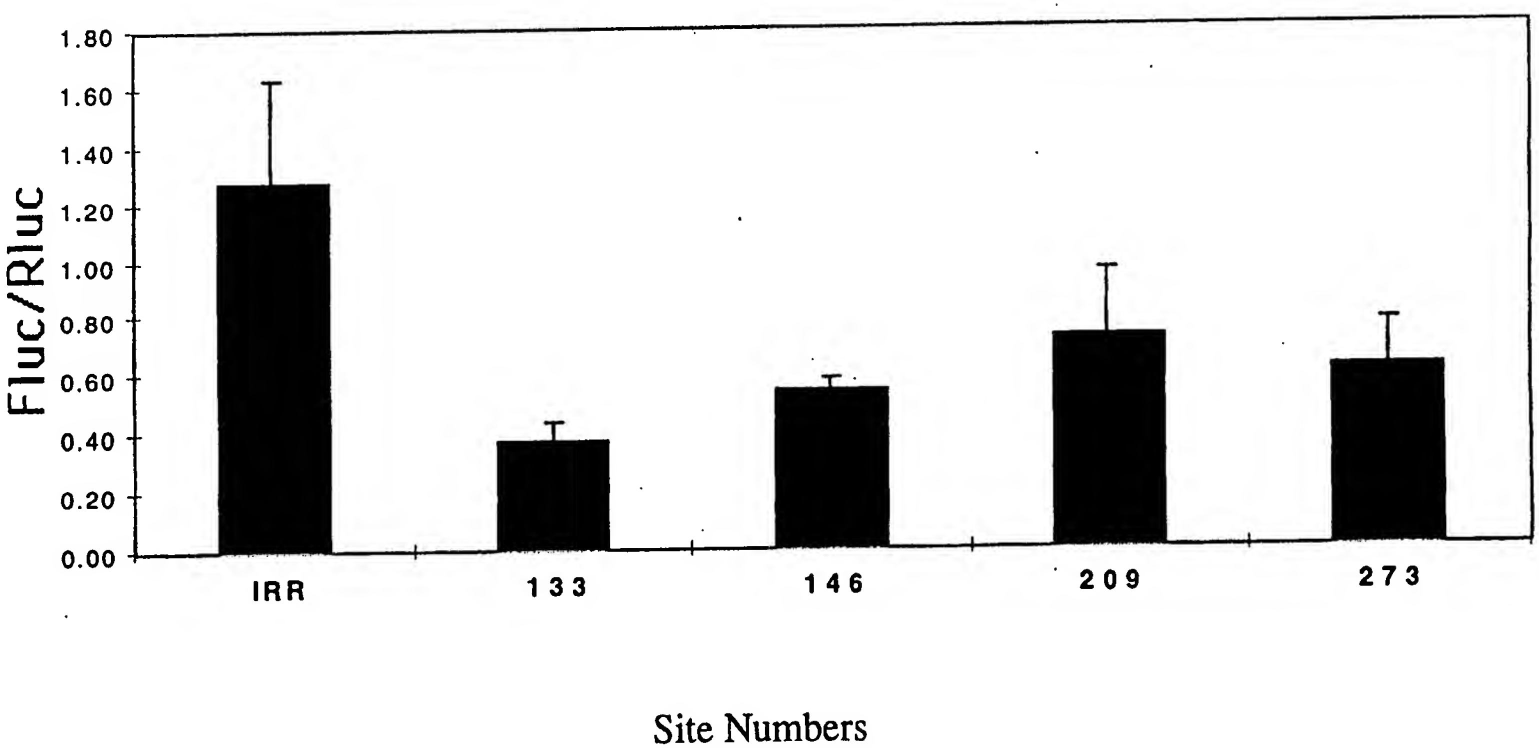
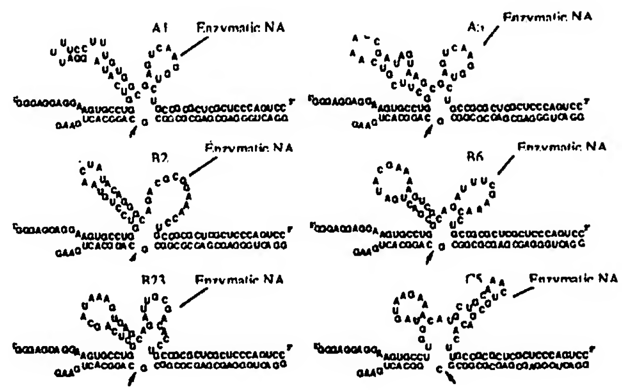


Figure 16. Efficacious Ribozymes Targeting 5'UTR HCV RNA



Sequence and chemical compositions for site numbers are given in table XII

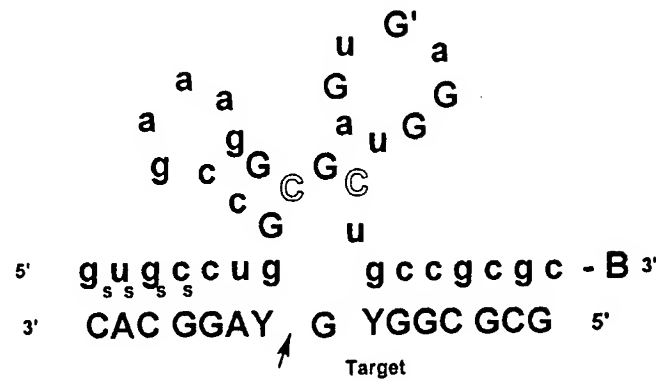
Figure 17. Characterized Class II Enzymatic Nucleic Acid Motifs



	Rate (min^{-1}) (Suboptimal)	Required NTP
A1	0.05	2'-NH_2-CTP
A5	0.03	2'-NH_2-CTP
B2	0.11	2'-NH_2-CTP
B6	0.1	2'-NH_2-CTP
B23	0.05	2'-NH_2-CTP
C5	0.01	2'-NH_2-CTP

These six motifs can all cleave with minimizations in the binding arms (7/7) and not significantly affect rate. All cytosine residues are 2-NH_2 modified. The arrows in the diagrams shown above indicate the cleavage site within the substrate. Enzymatic NA refers to the enzymatic nucleic acid molecule

Figure 18: Chemically Stabilized Class II Motif



<u>Legend</u>

Uppercase indicates natural ribo residues

C indicates 2' - d-NH_2-C

Lowercase: 2'-*O*- Me

Subscript $_s$ indicates phosphothioate linkage

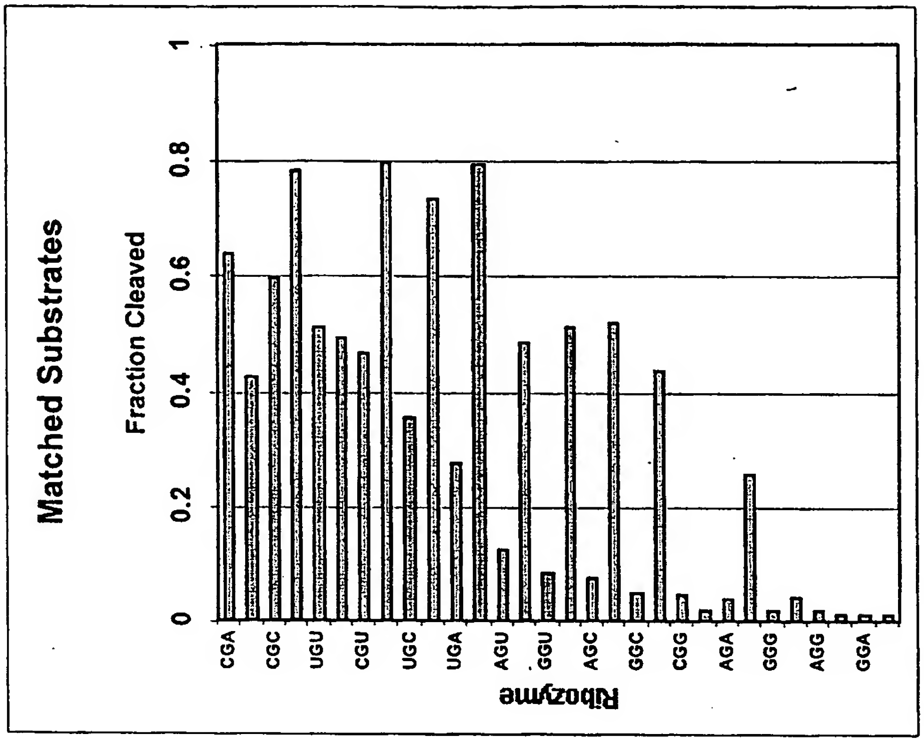
B: 3'-3' abasic moiety

Y = U or C

G' can be G, ca, or caa

The gaaa tetraloop can be replaced by 18 atom polyethylene glycol (Spacer)

All ribo G's can be replaced with 2'-*O-methyl* G



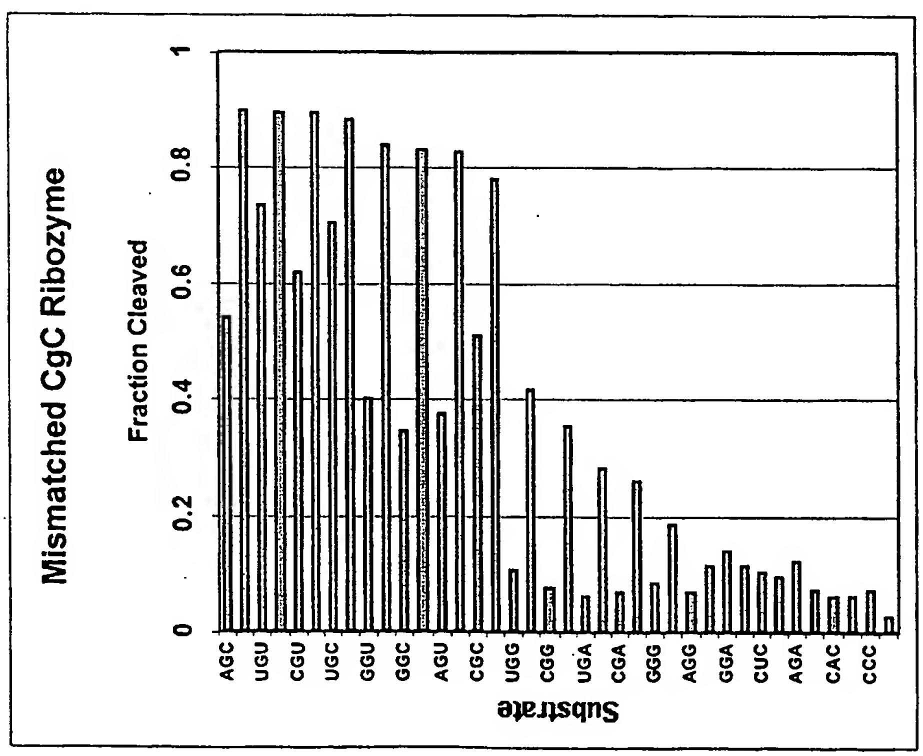
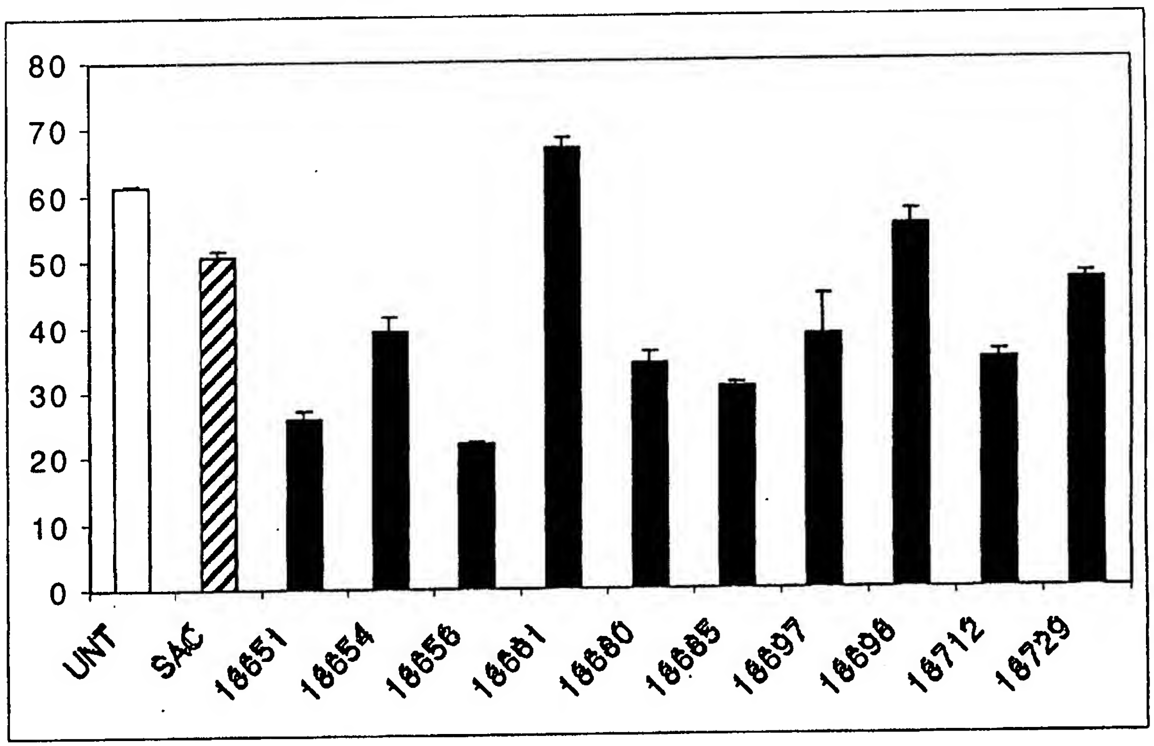


Figure 19: Substrate specificities of Class II (zinzyme) ribozymes

Figure 20: Representative data of HER2 cell proliferation primary screen of Class II (zinzyme) Ribozymes

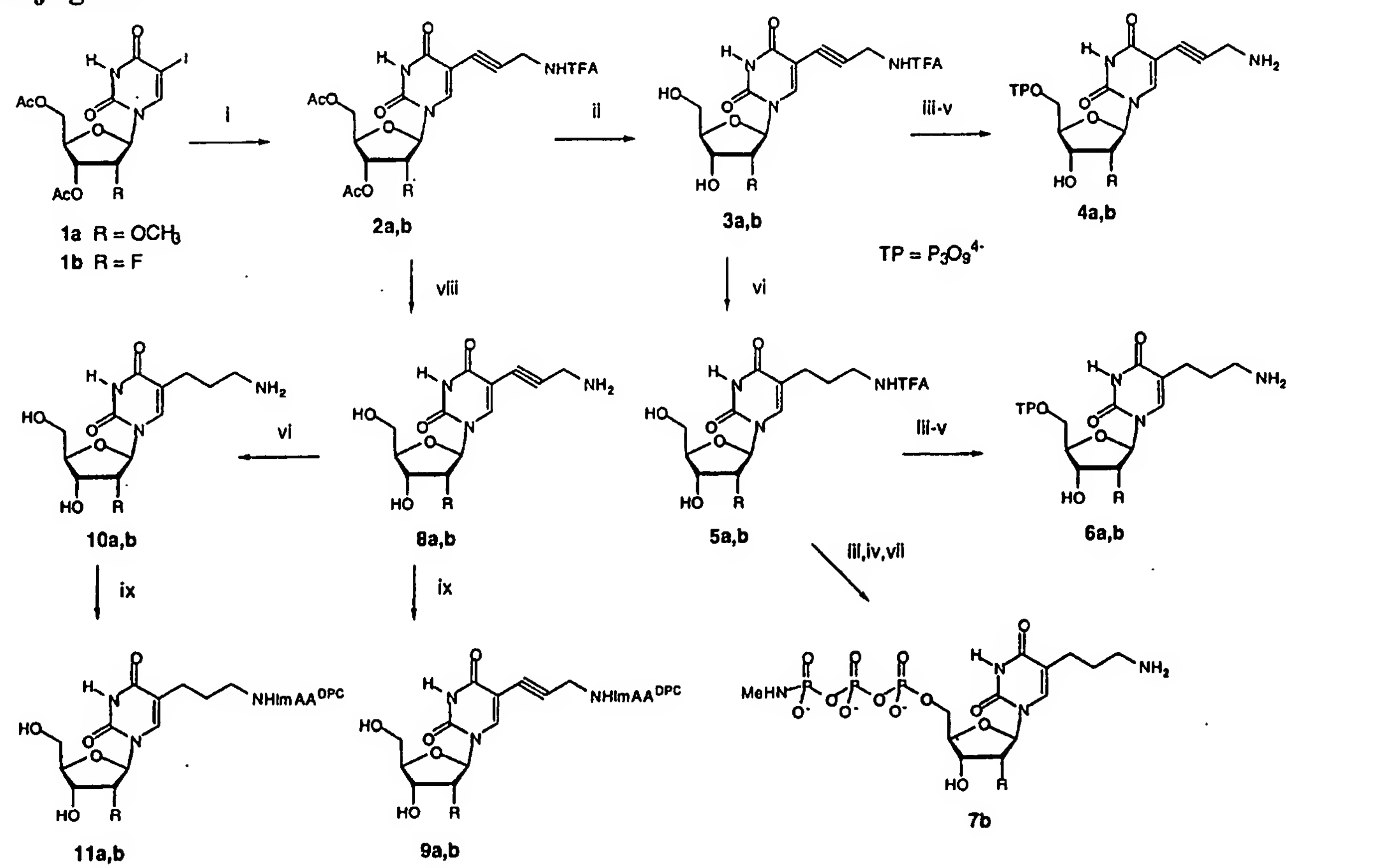
Nuclear Area (Fluorescence)



Treatment (RPI number)

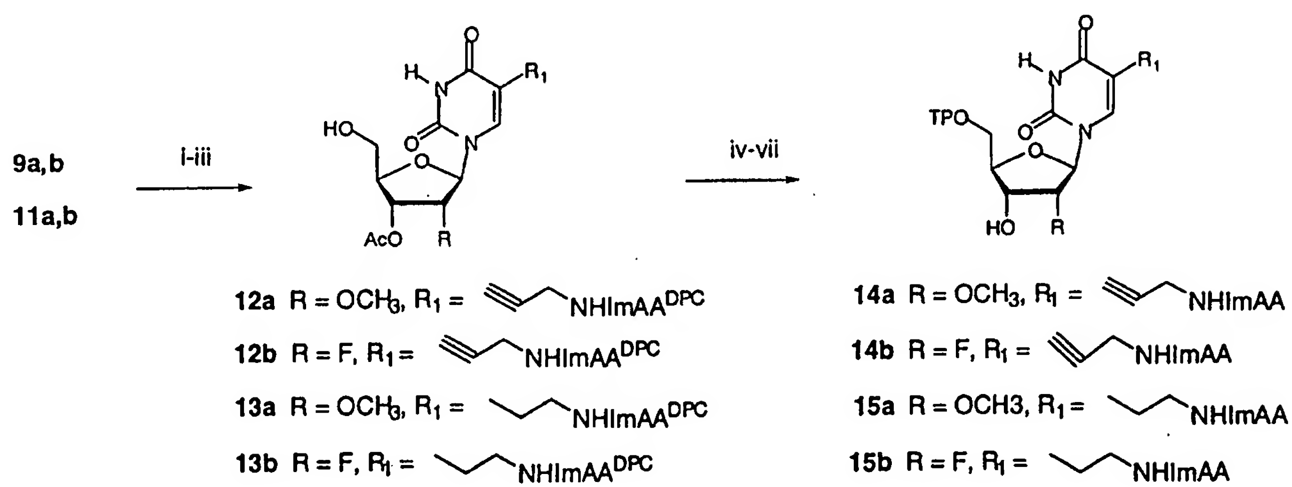
SKBR3 breast carcinoma cells
2 μg/mL RPI.9649 (lipid)
200 nM ribozymes
120 hour timepoint
UNT = untreated
SAC = scrambled attenuated control

Figure 21: Synthesis of 5-[3-aminopropynyl(propyl)]uridine 5'-triphosphates and 4-imidazoleacetic acid conjugates



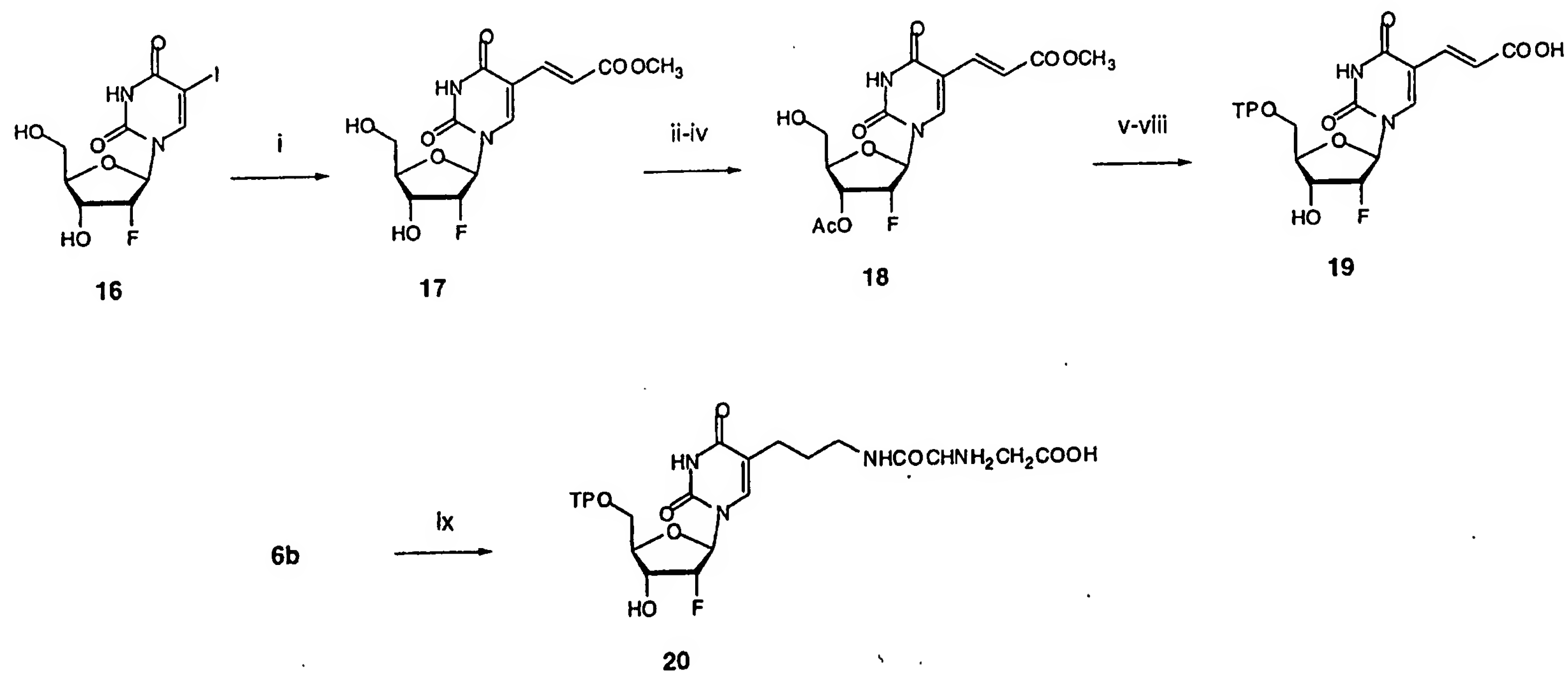
Reagents and Conditions: (I) *N*-TFA propargylamine, CuI, tetrakis(Ph_3P)Pd(0), Et_3N, DMF, 16 h, (ii) aq NaOH, pyr, MeOH, 0 °C, 1 h, (iii) $POCl_3$, Proton-Sponge, $(EtO)_3PO$, 2 h, (iv) *n*-Bu_3N PPi, MeCN, 15 min., (v) 1M $Et_3NH^+HCO_3^-$, then NH_4OH, 16 h, (vi) H_2, 5% Pd-C, 24 h, 40 psi, (vii) 40% $MeNH_2$, 3 h, (viii) NH_4OH, 4 °C, 16 h, (ix) $ImAA^{DPC}$, EDCHCl, DMF, 16 h.

Figure 22: Synthesis of 5-[3-(N-4-imidazoleacetyl0aminopropynyl(propyl)]uridine 5'-triphosphates



Reagents and Conditions: (I) DMT-Cl, pyr, 16 h, (ii) Ac_2O, pyr, 2 h, (iii) 3%TCA, CH_2Cl_2, 2 h, (iv) 2-Cl-4*H*-1,3,2-benzo-dioxaphosphorin-4-one, pyr, dioxane, 30 min., (v) *n*-Bu_3N PPi, DMF, 30 min., (vi) I_2, pyr-H_2O, 20 min., (vii) NH_4OH, 2 h.

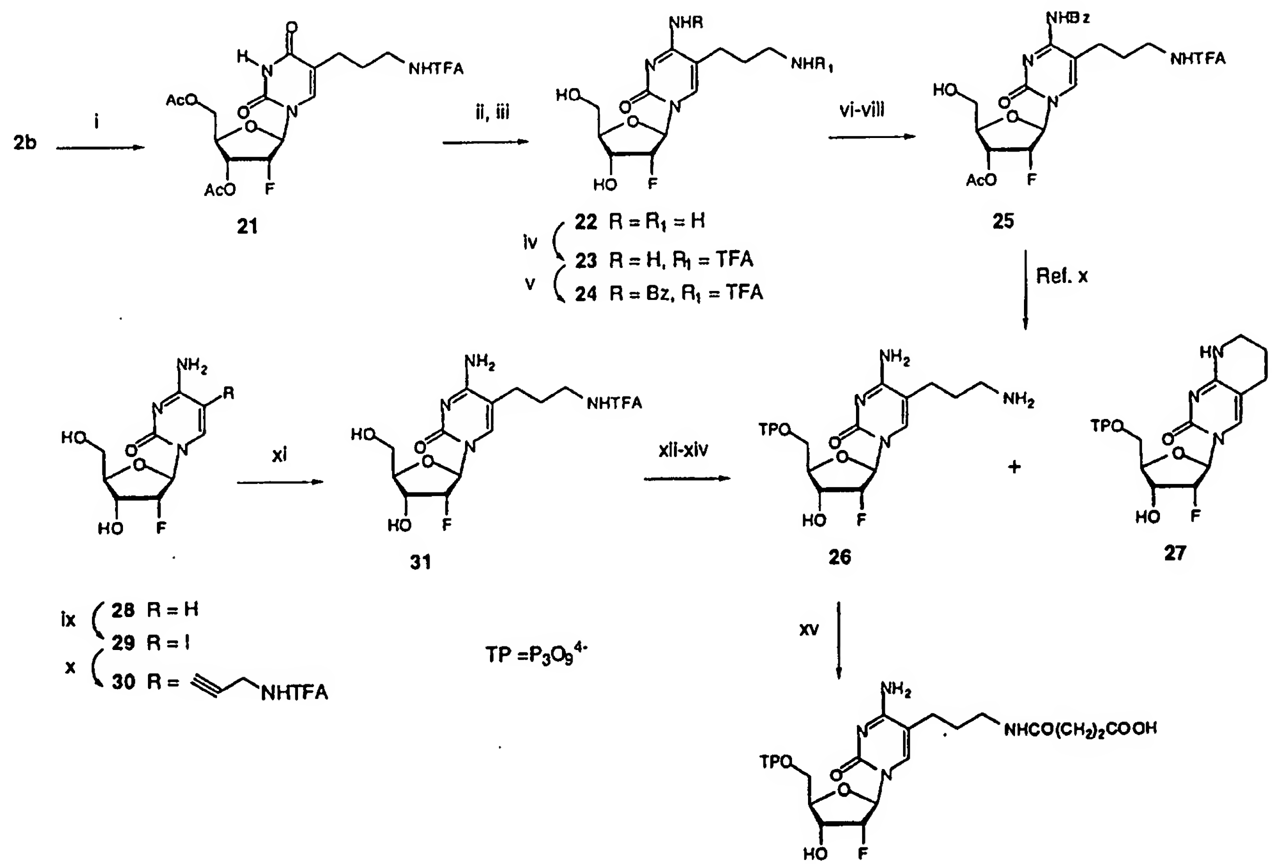
Figure 23: Synthesis of Carboxylate tethered uridine 5'-triphosphoates



Reagents and Conditions: (1) methyl acrylate, Ph_3P, Pd(II)acetate, Et_3N, dioxane, 30 min., reflux, (ii) DMT-Cl, pyr, 16 h. (iii) Ac_2O, pyr, 3 h, (iv) 3% TCA, CH_2Cl_2, 1 h, (v) 2-Cl-4*H*-1,3,2-benzodioxaphosphorin-4-one, pyr, dioxane, 30 min., (vi) *n*-Bu_3N PPi, DMF, 30 min., (vii) I_2, pyr-H_2O, 20 min., (viii) 1N NaOH, 5 h,

(ix) Fmoc-Asp-OFm NHS-ester, DMF-0.1M $Na_2B_4O_7$, 16 h, then Et_2NH, 3 h.

Figure 24: Synthesis of 5-(3-aminoalkyl) and 5-[3(N-succinyl)aminopropyl] functionalized cytidines



32

Reagents and Conditions: (i) H_2, 5% Pd-C, 24 h, 40 psi, (ii) $POCl_3$, 1,2,4-triazole, Et_3N, MeCN, 16 h, (iii), NH_4OH, dioxane, 16 h, (iv) CF_3COOEt, Et_3N, MeOH, reflux, 3 h, (v) Bz_2O, EtOH, reflux, 5 h, (vi) DMT-Cl, pyr, 16 h, (vii) Ac_2O, pyr, 3 h, (viii) 3% TCA, CH_2Cl_2, 3 h, (ix) HIO_3, I_2, AcOH, CCl_4, H_2O, 45 °C, 4 h, (x) *N*-TFA propargylamine, CuI, tetrakis(Ph_3P)Pd(0), Et_3N, DMF, 16 h, (xi) H_2, 5% Pd-C, MeOH, 72 h, 40 psi, (xii) $POCl_3$, Proton-Sponge, $(MeO)_3PO$, 2 h, (xiii) *n*-Bu_3N PPi, MeCN, 15 min., (xiv) NH_4OH, 4 °C, 16 h, (xv) succinic anhydride, DMF-0.1M $Na_2B_4O_7$ 1:1, 16 h.

Figure 25: Class I ribozyme stem truncation/loop replacement

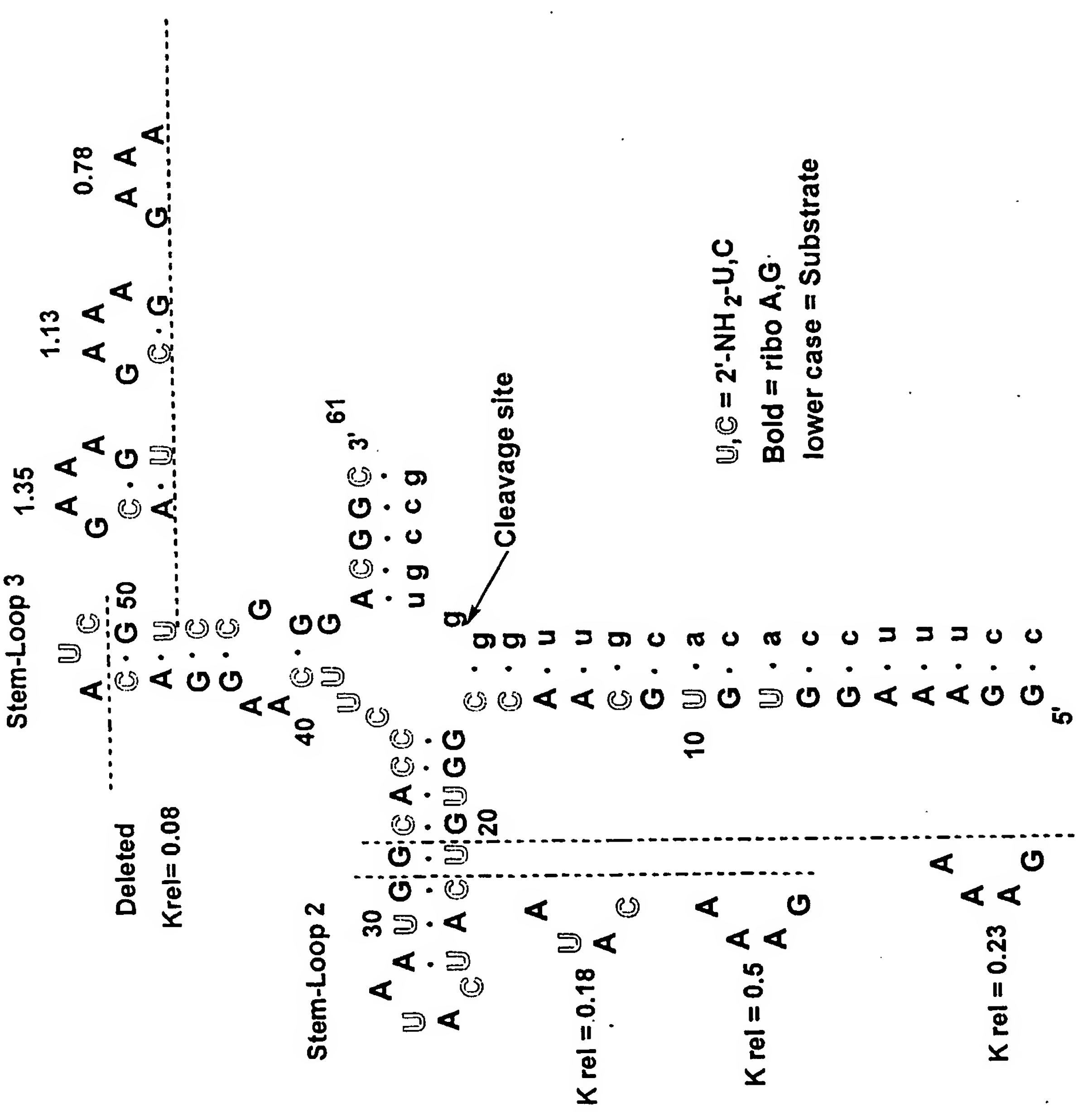
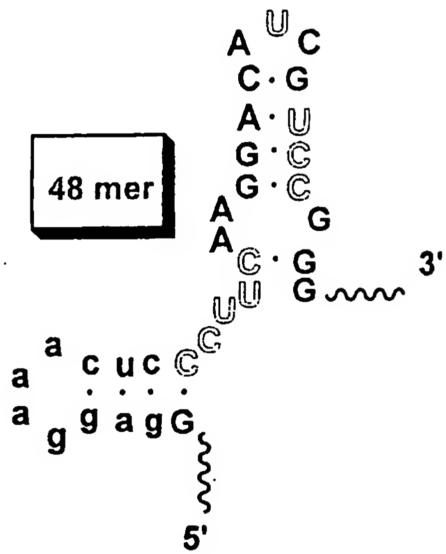
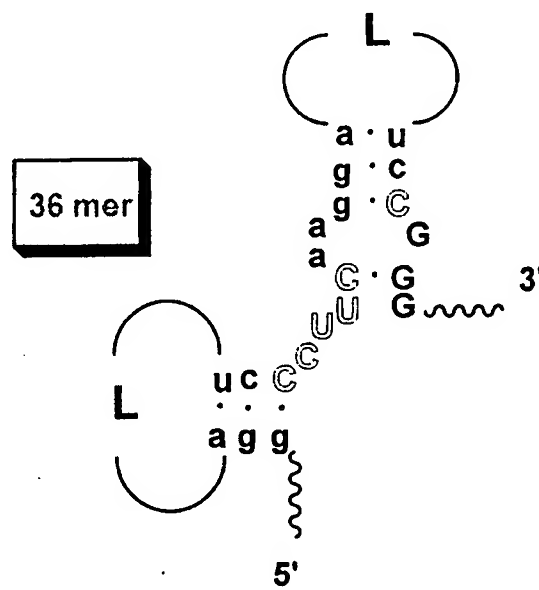


Figure 26: Class I ribozyme Stem truncation and Loop replacement



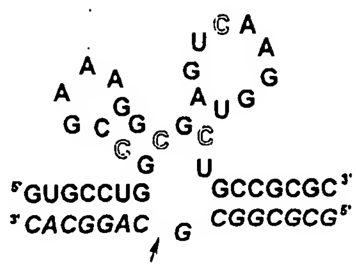


C and U = 2'-deoxy-2'-amino C, U

Upper case = ribo
lower case = 2'-O-methyl
L = hexaethylene glycol linker
~~~ = binding arms
~~~

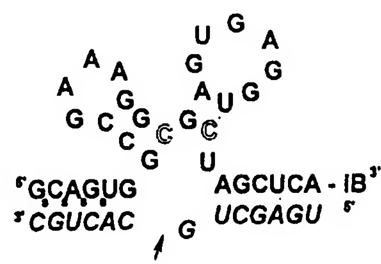
Figure 27: Non ribo Class II (zinzyme) motifs

Figure 27a



Substrate is the Kras site 521

Figure 27b



Substrate is the HER2 site 972

Legend
Italic indicates natural ribo residues
C indicates 2' - NH_2-C
A G C U indicates 2'-OMe residues
Subscript $_s$ indicates phosphothioate linkage
IB indicates inverted deoxy abasic residue

Figure 28: Non ribo Class II (zinzyme) cleavage reactions

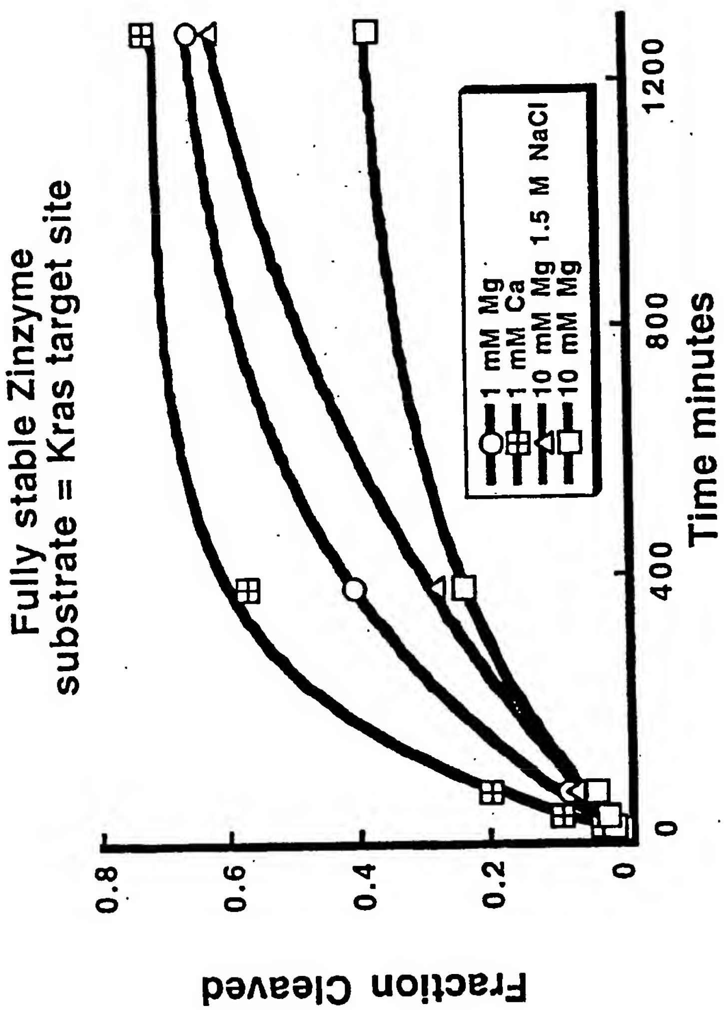
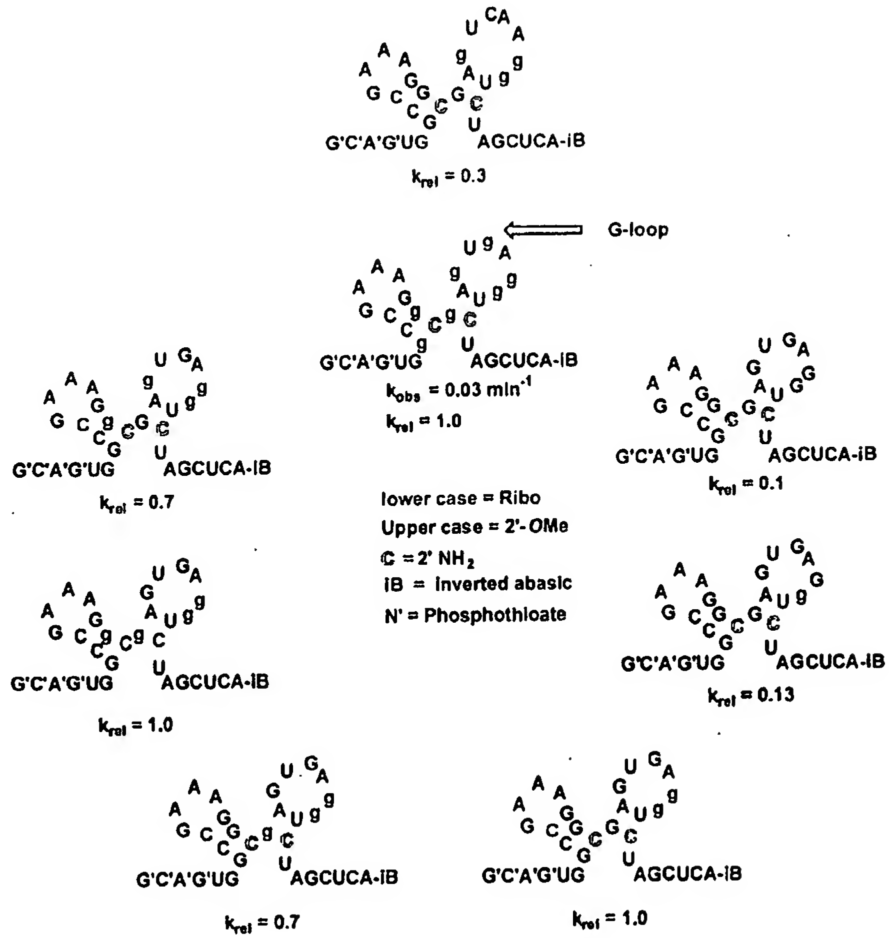


Figure 29: Positional testing of ribose positions in Class II (zinzyme) nucleic acid catalysts targeting HER2 site 972



All assays done under selection conditions - physiological buffer 1 mM Mg, 1 mM Ca 37^0 C Susbstrate 15-mer HER2 site 972

Figure 30: RPI 18656 Mediated Decrease in HER2 RNA site 972 vs SAC

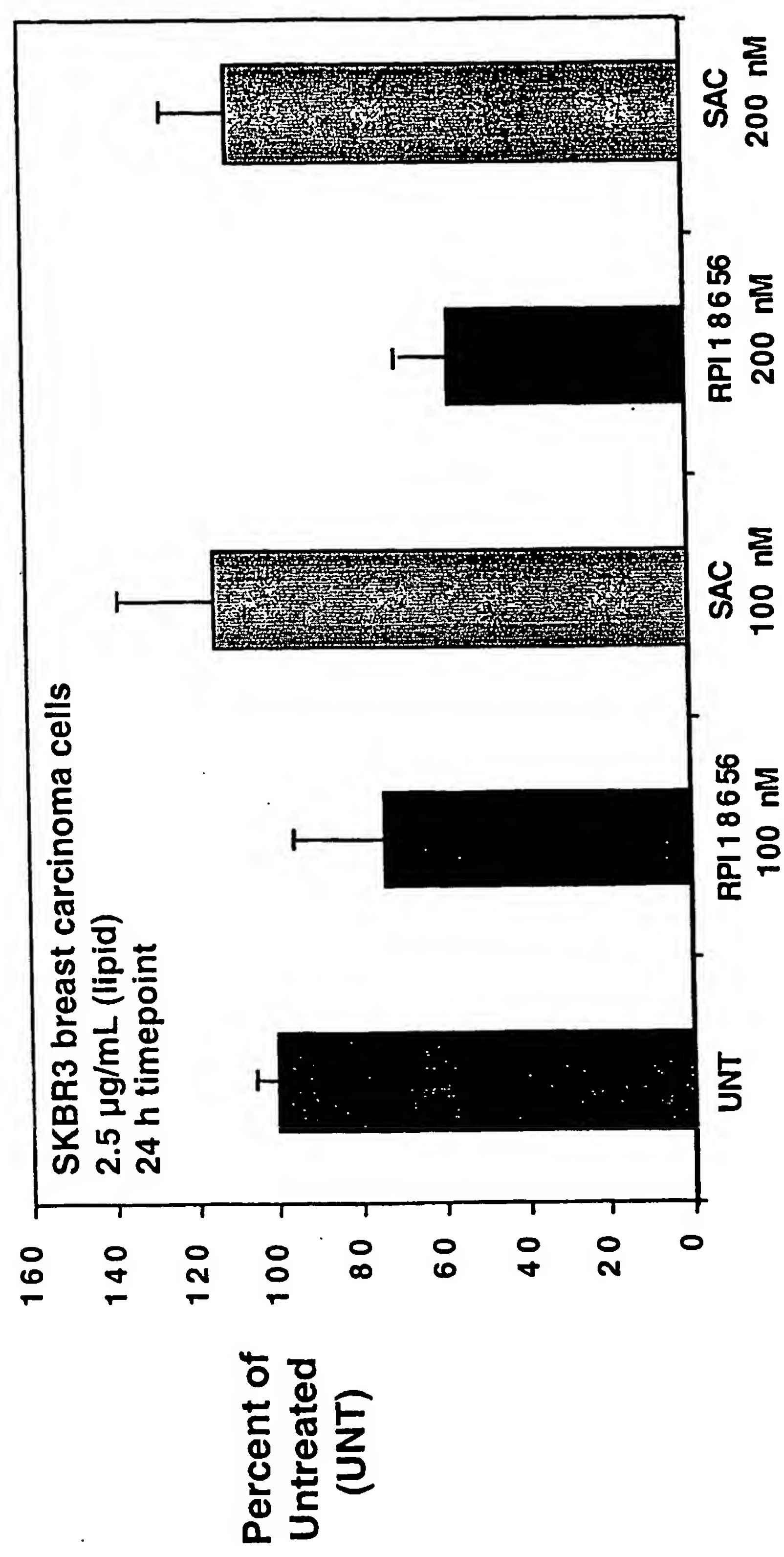


Figure 31: Dose Response of RPI 18656 Against Site 972 in Antiproliferation Assay

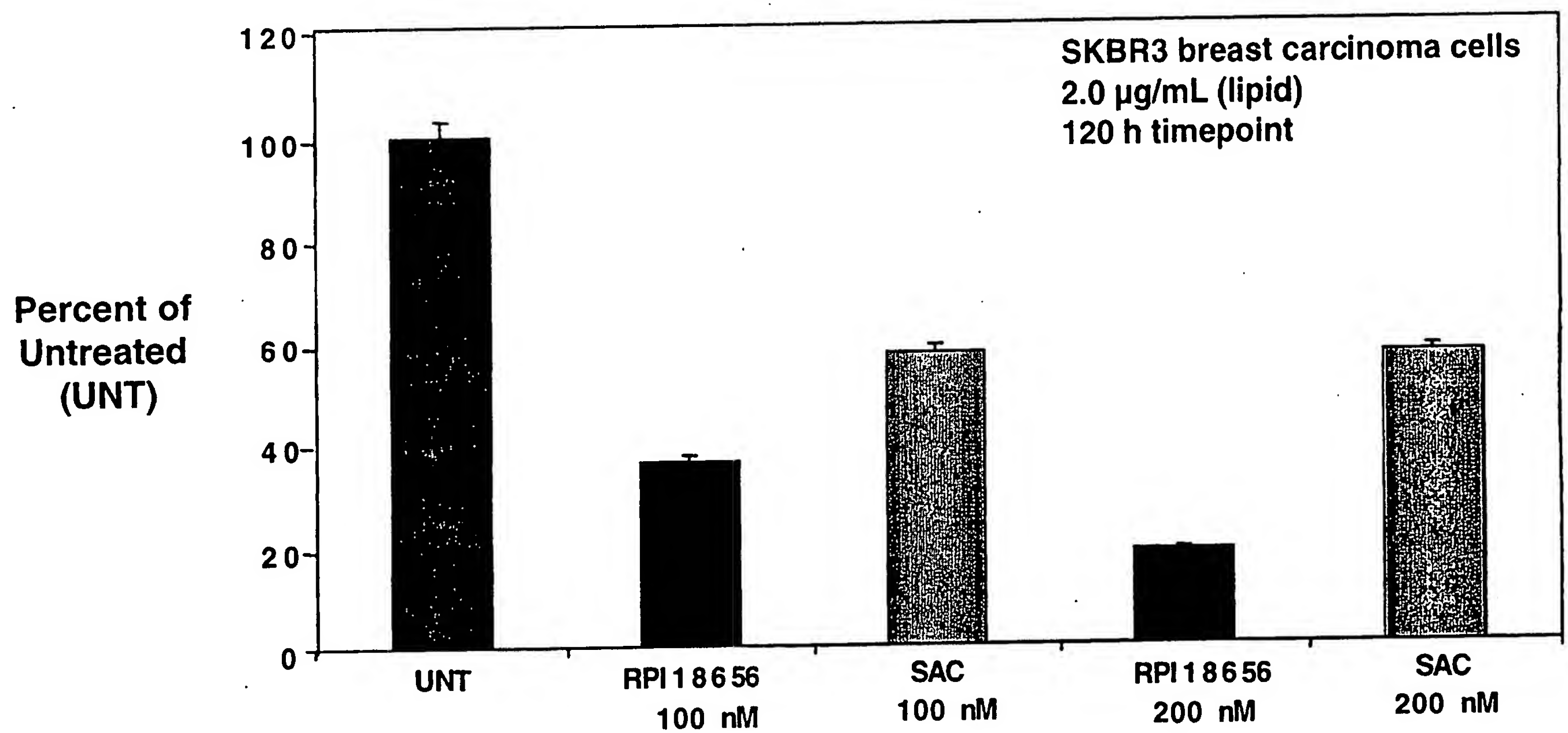


Figure 32: Dose-Dependent HER2 RNA Reduction after Treatment with RPI 19293

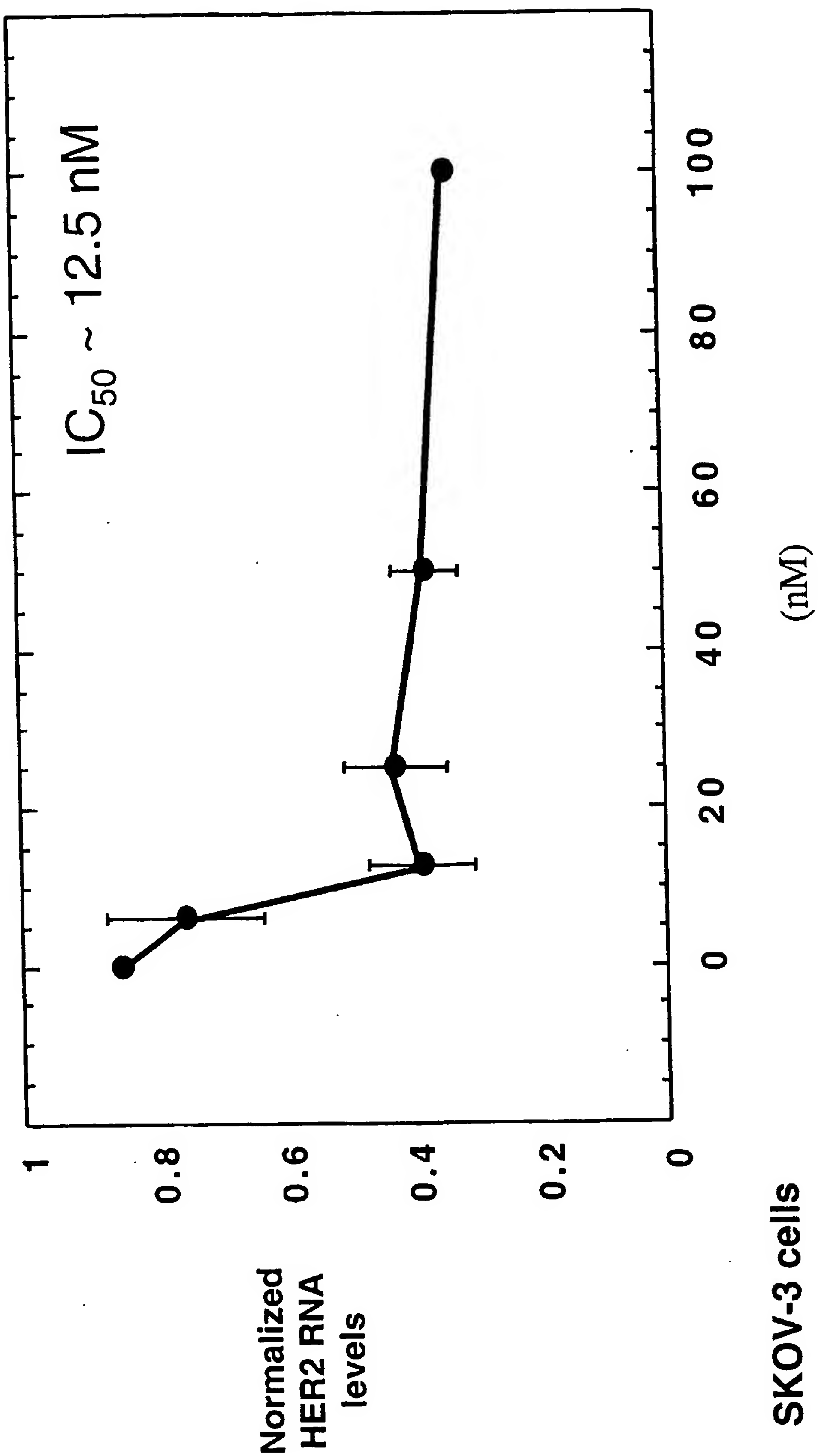


Figure 33: Dose-Dependent HER2 RNA Reduction & Inhibition of Cell Proliferation (RPI.19293)

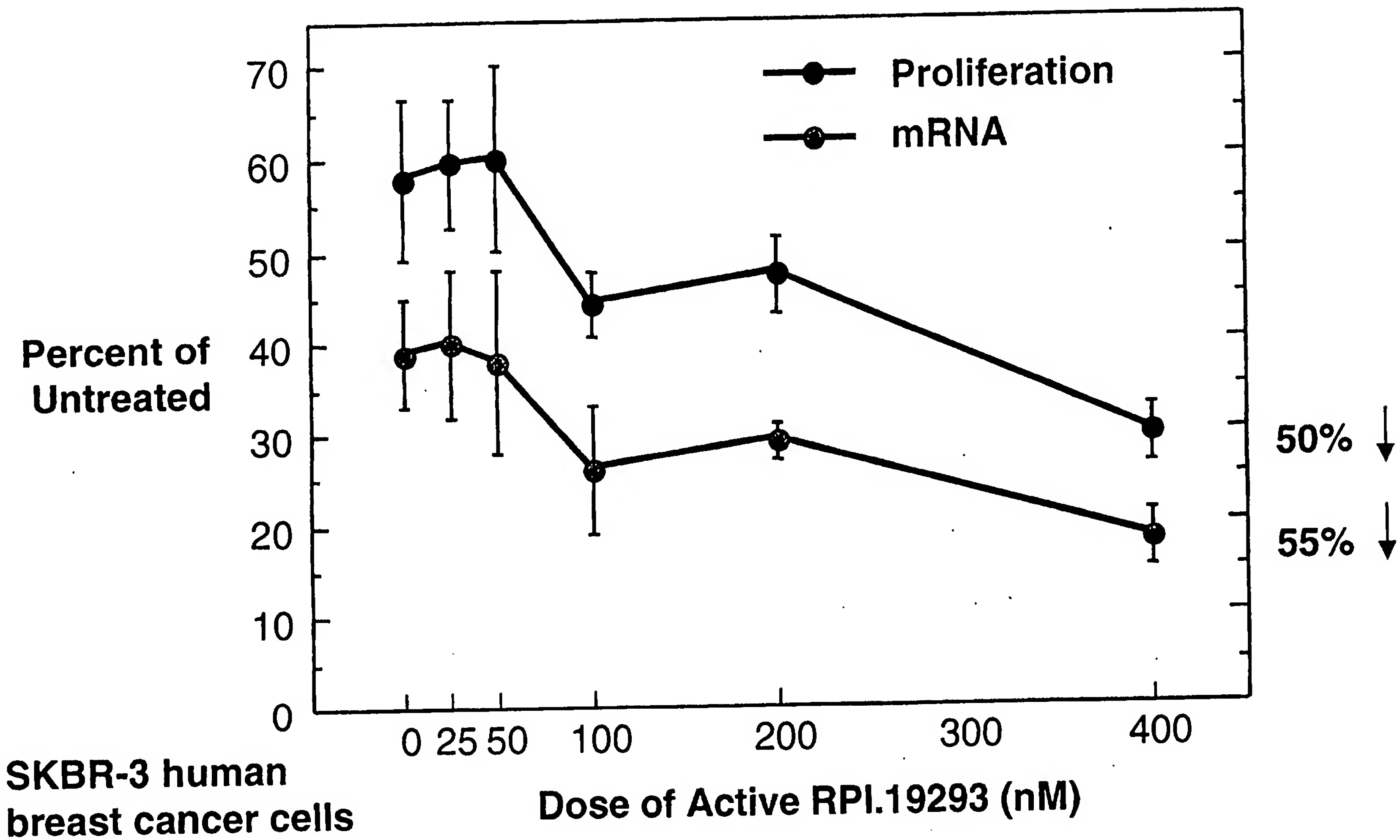
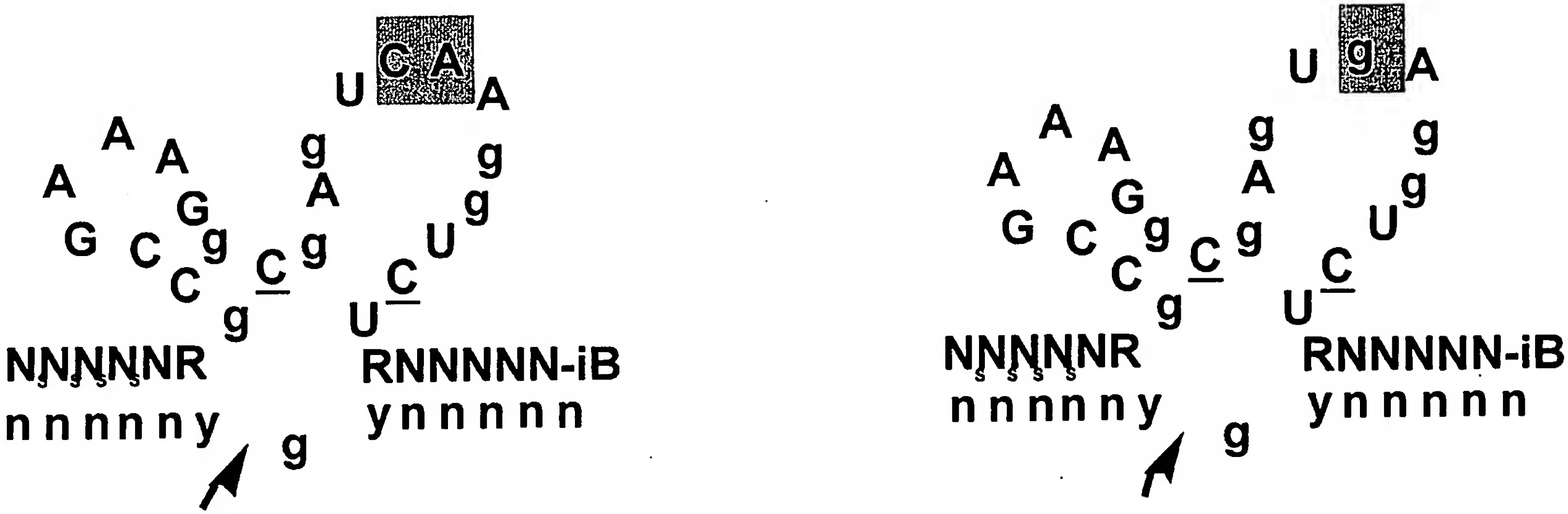


Figure 34: Zinzyme CA →G loop (7-ribo)



Lower case = 2'-OH
Underline = 2'-NH_2
UPPER CASE = 2'-*O*-Me
N_s = Phosphothioate linkage

Figure 35: Screen of Zinzymes (containing ribose-G reductions) for Anti-proliferative Activity

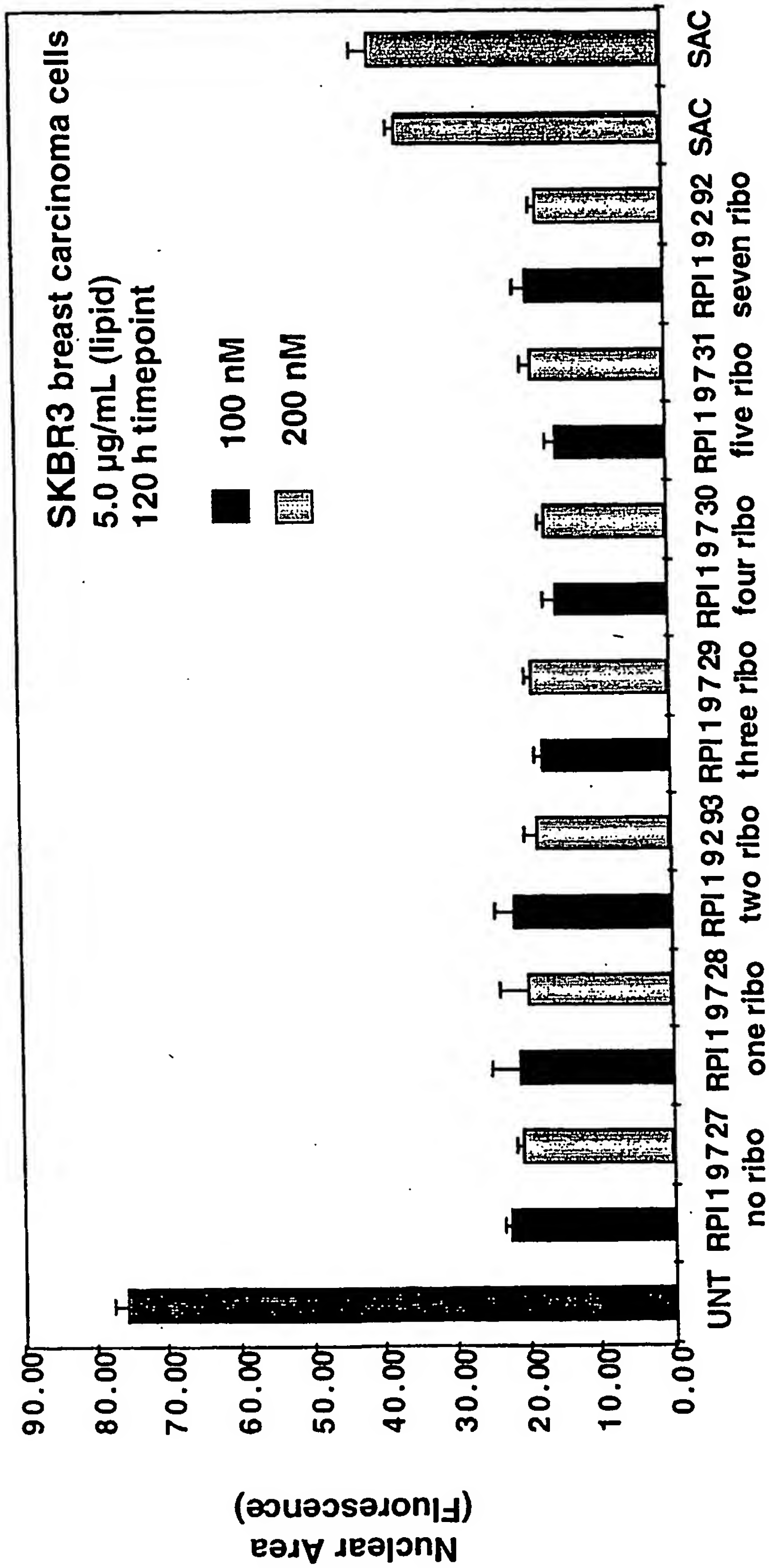
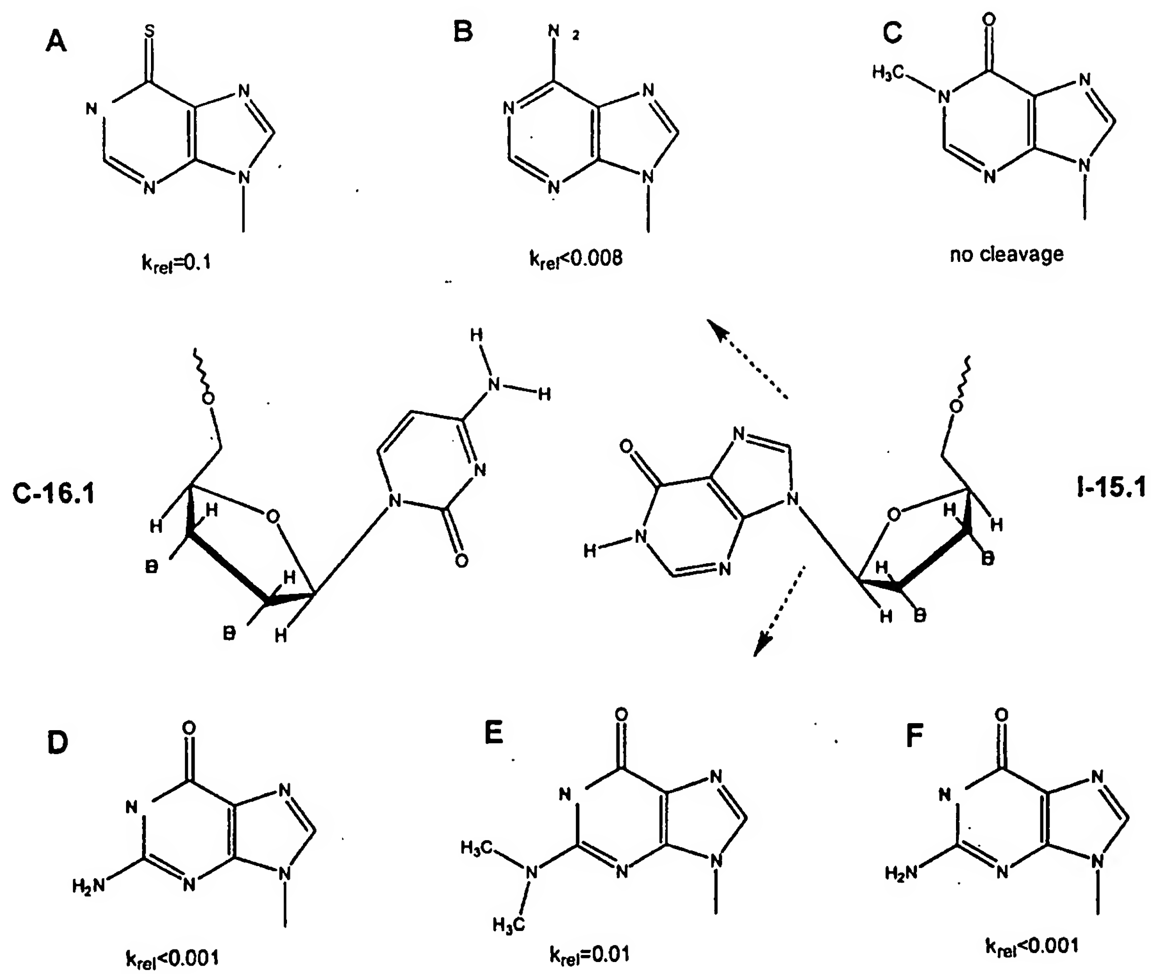
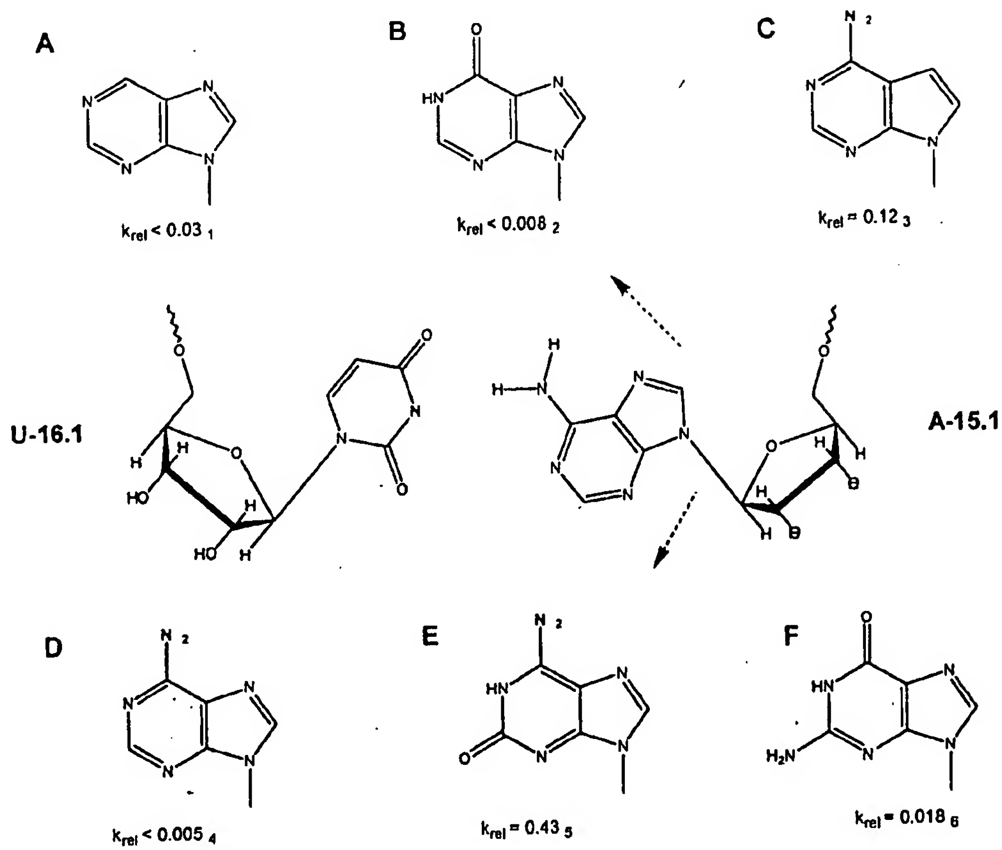


Figure 36: Effect of substitutions at NCH ribozyme position 15.1



k_{rel} values describe the cleavage rate relative to I-15.1 acitivity

Figure 37: Effect of substitutions at Hammerhead Ribozyme position 15.1



1. Slim and Gait, 1992, *Biochem Biophys Res Commun*, 183, 605-609.
2. Ludwig *et al.*, 1998, *Nucleic Acids Res.*, 26, 2279-2285.
3. Seela *et al.*, 1993, *Helvetica Chimica Acta*, 76, 1809-1819.
4. Seela *et al.*, 1998, *Nucleic Acids Res.*, 26, 1010-1018.
5. Ng *et al.*, 1994, *Biochemistry*, 33, 12119-26.
6. Bevers *et al.*, 1996, *Biochemistry*, 35, 6483-90.

k_{rel} values describe the cleavage rate relative to A-15.1 acitivity